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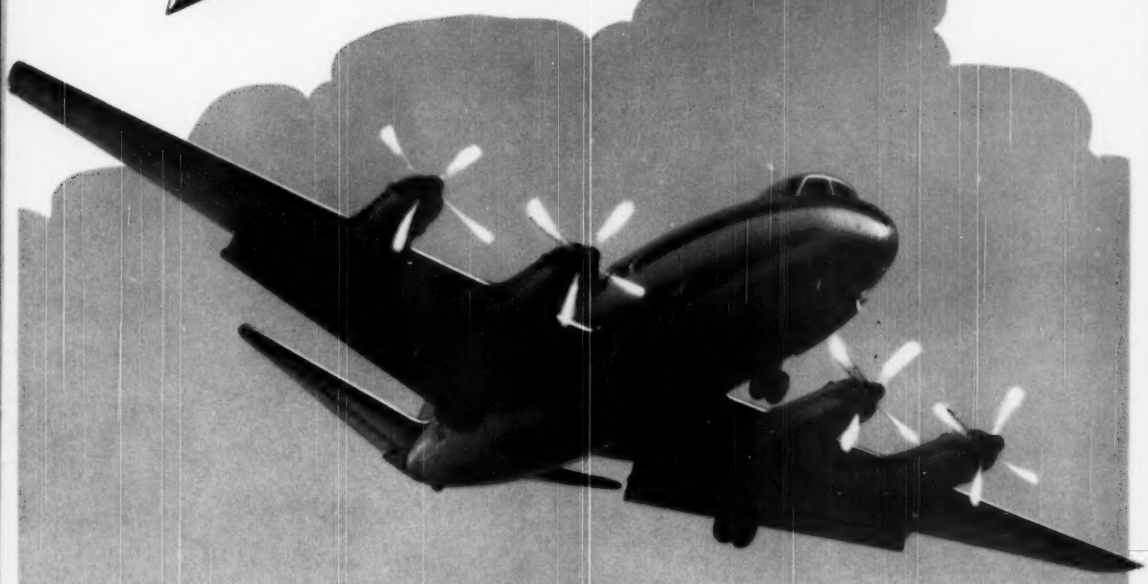

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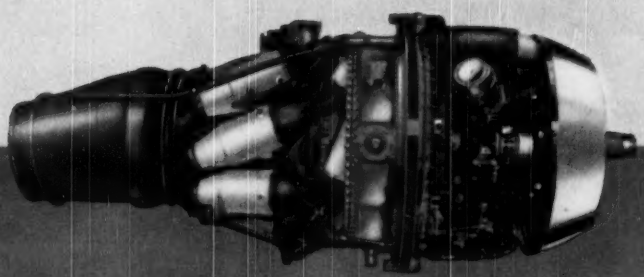

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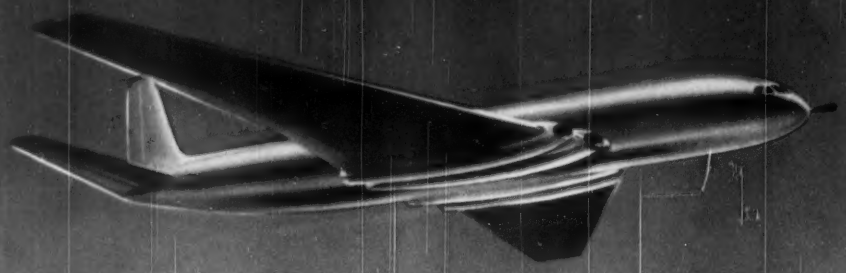

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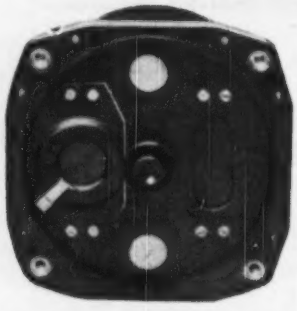

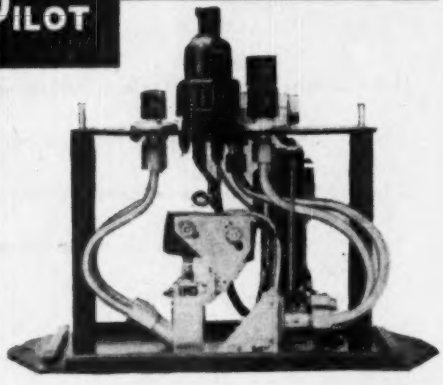

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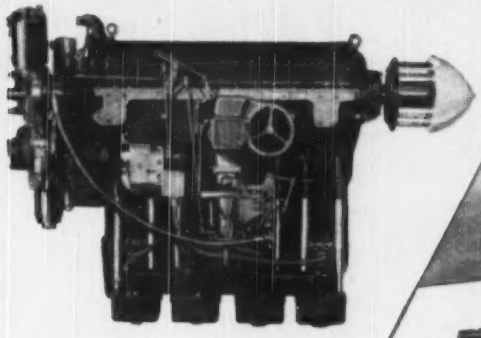

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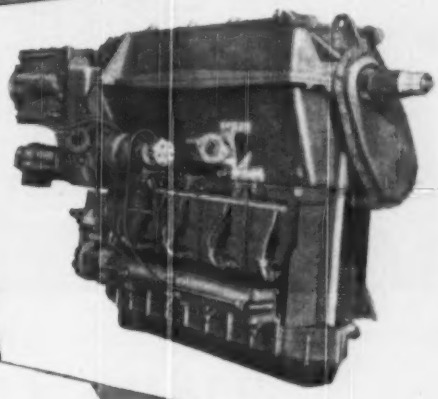

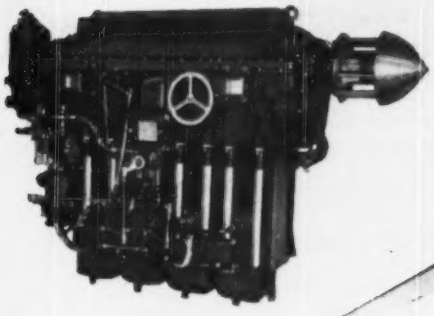

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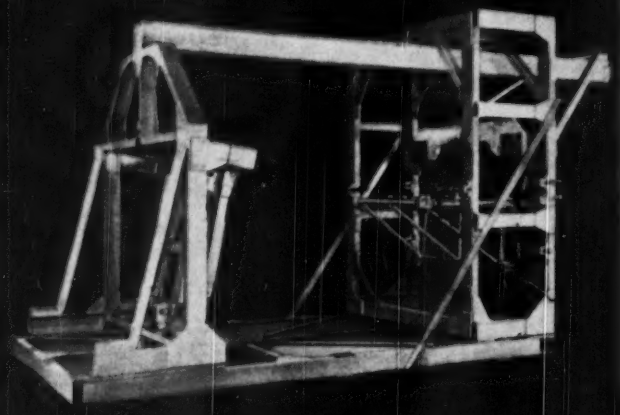

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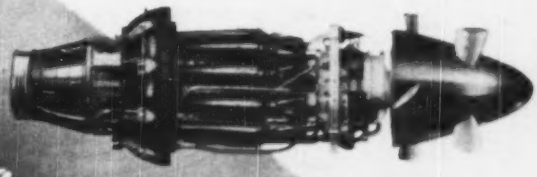

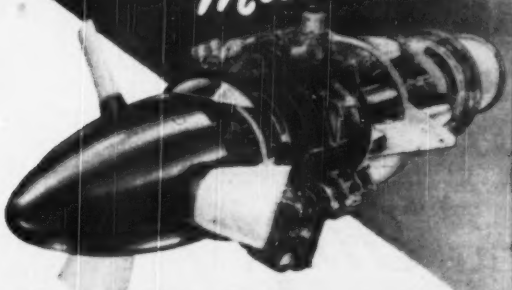

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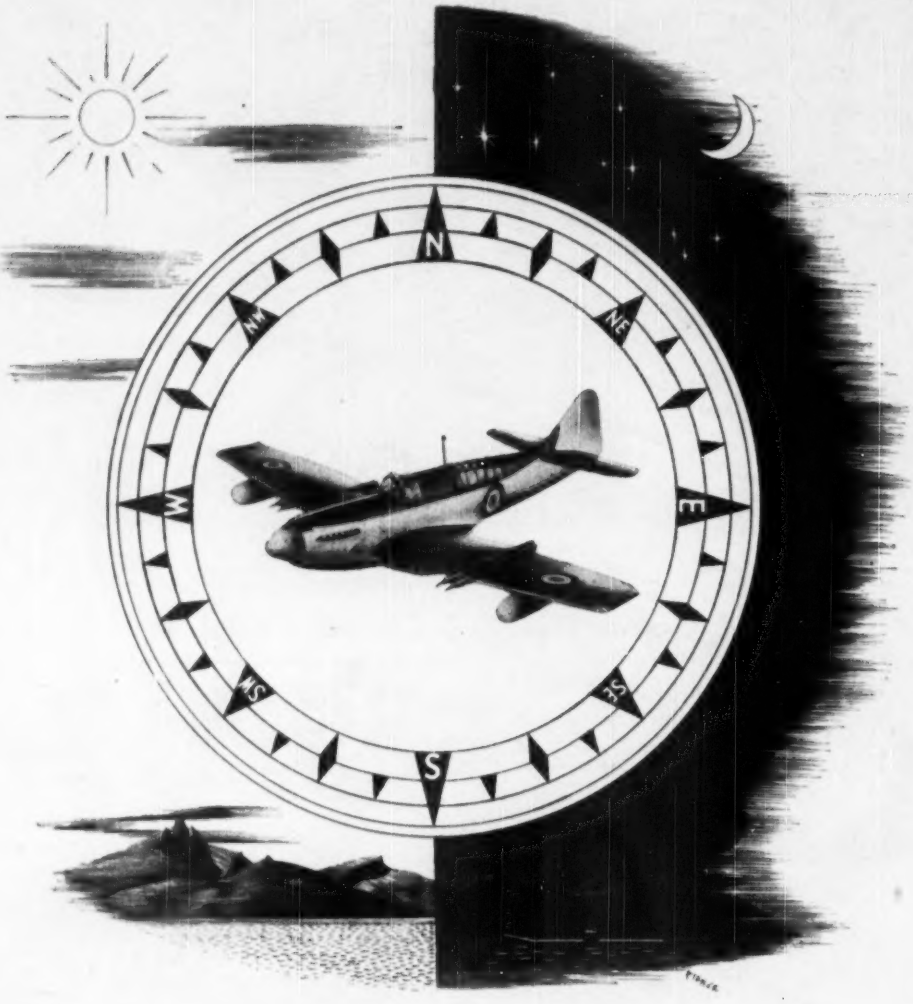

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Frustration Unlimited

SELDOM before have so many different industries, the aircraft industry among them, felt impelled to raise their voices in protest as they now do against the doubling of the tax upon fuels. If farming, with its various aids and guaranteed prices, is to have relief from this tax, which from the start has been aimed at road users, there is surely a strong case for concessions to be made to aircraft operators, who for a long time past have been handicapped by a ninepence-a-gallon *road* tax. Home-produced food can save foreign currency; aviation has shown itself to be a capable dollar-earner. In passing, we should perhaps thank Sir Stafford Cripps for his (unintentional?) encouragement of gas-turbine-powered aircraft; aviation kerosene, untaxed in the past, remains so.

Additional fuel bills to be met by the Corporations for local flights and road transport (tax on fuel used outside the country is recoverable) have been estimated at £168,000 for B.O.A.C. and £115,000 for B.E.A. Presumably these burdens, together with the effects of devaluation, will simply make the balance-sheets look less promising—a most discouraging result for those who have worked so hard to reduce the deficits. In any case, the taxpayer will ultimately have to foot the bill.

Independent commercial operators, the private owners, and the long-suffering flying clubs—all relatively small users of fuel, many of whom are already at their wits' end—now suffer a further cruel and unjustifiable setback. No less than 15s per hour will be added to the expense of running a Rapide, for example, and even the cost of flying the humble Tiger Moth will be increased by more than 5s per hour.

British Bombers Needed

NOT unnaturally, the continued absence of any modern British long-range bomber is causing some anxiety, but no one should imagine that this country has gone, or intends to go, out of the big-bomber business. When, as happens from time to time, someone abroad suggests that so-called "strategic bombing" should become the responsibility solely of the American Air Force, and that in Europe we should concentrate on defence, a measure of irritation is added to the feeling of anxiety. All other considerations apart, we believe that to a would-be aggressor the fear of what he may get back in return is just as powerful a deterrent as the thought of the defence forces awaiting his bombers.

Everybody must by now know why, for the time being, there are no modern home-built aircraft available to our bomber squadrons. Assurances have been given, however, that designs are on the way, and we do not doubt that they, like their forerunner and first British jet bomber, the Canberra, will prove to have been well worth waiting for. We state categorically, and knowing ourselves to be in good company, that the R.A.F. *must* be maintained as a balanced, flexible air force, and this cannot be achieved if any single branch is missing or neglected.

It is probable that in America the rather overworked terms "strategic" and "tactical" are applied in many instances for convenience only, and in some quarters their true significance has come to be misunderstood. As Lord Tedder has pointed out, to try to draw hard-and-fast distinctions between these two relative terms is not merely unsound but actually dangerous.

In part, the strength of any Anglo-American alliance lies in the combination of the individual abilities of the two nations—certainly not in the subordination of one to another; this is especially apparent now (as it was during the war) in aviation. There is considerable divergence of views regarding fighter design, and there is little doubt that specifications for future R.A.F. bombers differ considerably from those worked out in America. We at least know that all available effort over here, small though it seems, is being devoted to the development of turbojet bombers of very advanced conception—bombers that will fly very high and very fast. In America, a country which is already putting into service long-range, high-altitude bombers there still appears to be some doubt as to just what is wanted.

The Theseus-powered Hermes V follows the tricycle landing-gear fashion, set by its immediate predecessor, the Hermes Mk IV.

An Examination of Landing Gear Design Characteristics

By

H. K. MILLICER*,

Dpl. Ing., M.Sc., A.F.R.Ae.S.

NOSEWHEEL or TAILWHEEL?

MUCH has been said in the past on the rather controversial subject of a choice of undercarriage type for a given aircraft. Both the nosewheel and tailwheel varieties of undercarriage layout have their own intrinsic characteristics which make them individually suited for different types of aircraft. This being so, it is felt that the best purpose may be served by examining the merits and disadvantages of both types of undercarriage from four distinct viewpoints, namely, (i) stability and performance; (ii) structural problems; (iii) weight comparison; (iv) design criteria.

Any examination of the relative characteristics makes it clear that the most pronounced differences between the nosewheel and tailwheel configurations occur in relation to stability. The tendency to bounce or ground-loop after landing is practically eliminated when a tricycle undercarriage is used; furthermore, such a layout also greatly increases the safety of blind- and cross-wind landings and, in this connection, the field of view from the cockpit is greatly enhanced (for ground manœuvring) on a tricycle aircraft, especially if it is a single-engined type.

When a steerable nosewheel is used, the take-off safety for multi-engined aircraft is improved. At the 1948 S.B.A.C. display at Farnborough, the Airspeed Ambassador demonstrated a single-engined take-off, the "dead" airscrew being feathered throughout. This performance was achieved through the nosewheel taking approximately two-thirds of the asymmetric thrust yawing moment, the remaining compensation being provided by the rudders in the slipstream.

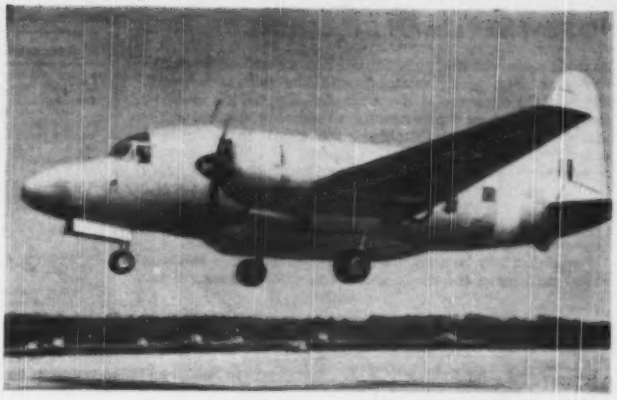
Whilst on the subject of safety, it is apposite to point out that there is a tendency for an aircraft equipped with a non-steerable nosewheel to run down the gradient of an undulating airfield. This could be distinctly unpleasant if the gradient happened to be across the runway, as the aircraft would tend, so to speak, to run off the course; it could, conceivably, become dangerous if brake pressure happened to be low. The reason for such behaviour can be understood from Fig. 1: with gravity pulling downhill and the main wheels trailing, the tendency of the castoring nosewheel is to follow the downhill lead rather than to offer opposition. A steerable or lockable nosewheel would prevent such a tendency and it is a fact that most personal aircraft in the U.S.A. have steerable nosewheels despite the complication and weight penalty incurred. A similar instability which, however, acts in the opposite direction, is displayed by the tailwheel-equipped aircraft (Fig. 2): in effect, the c.g. slips downhill with the castoring tailwheel following, and the aircraft tends to ground-loop. If the pilot is not sufficiently quick in checking this tendency, it can have quite dangerous results; the writer has, in fact, seen one fatal crash in similar circumstances.

There is little to choose between the two types of undercarriage configuration when their performances for take-off and landing are compared. It has been established that the best take-off run, irrespective of undercarriage layout, is obtained when the lift coefficient in the static attitude, $C_{L_{s.a.}}$, is equivalent to $\mu \times \pi \times A$, where μ is the coefficient of friction and A is the aspect ratio of the wing. When this formula is applied, it can be seen that, for small values of μ (of the order of 0.02 and 0.03) such as would apply on good runways, the required take-off lift coefficients are reasonably small (of the order of 1.0) and, consequently, fuselage incidence is small when flaps are used for take-off.

On runways, therefore, the tricycle aircraft should have a shorter take-off run than that of its tailwheel counterpart, owing to fuselage incidence and drag being smaller and initial airscrew efficiency and thrust greater. On soft ground, these advantages are usually lost owing to the high incidence required (viz., formula) and the impossibility of

The Hastings is a successful military transport aircraft which still retains the tailwheel undercarriage of the common Hermes/Hastings prototype.

* *The author is project aerodynamicist to Percival Aircraft, Ltd., and is an A.R.B.-approved design consultant.*



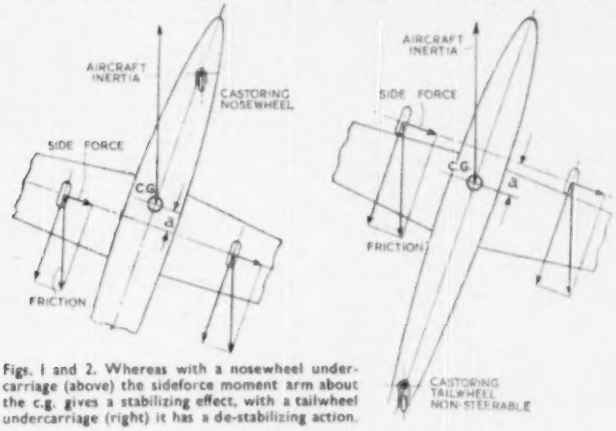
With a slightly longer fuselage, the Varsity T.1 crew-trainer is essentially a tricycle development of the Valetta military transport.

providing that incidence without incurring a high drag penalty for the cruising condition. The landing run should, in general, be somewhat better for nosewheel aircraft as a result of higher braking efficiency—except, perhaps, for very light aircraft not equipped with brakes and flaps. There may, however, be a difference in the tail-down incidence between the two undercarriage configurations which would result in lower landing speeds on the tailwheel types. As few people bother to make a three-point landing nowadays—aircraft are usually "wheeled in"—this eliminates the incidence advantage of the tailwheel type. Nevertheless, a nosewheel permits the pilot to apply the brakes hard, whereas similar action on a tailwheel aircraft can incur the danger of nosing-over.

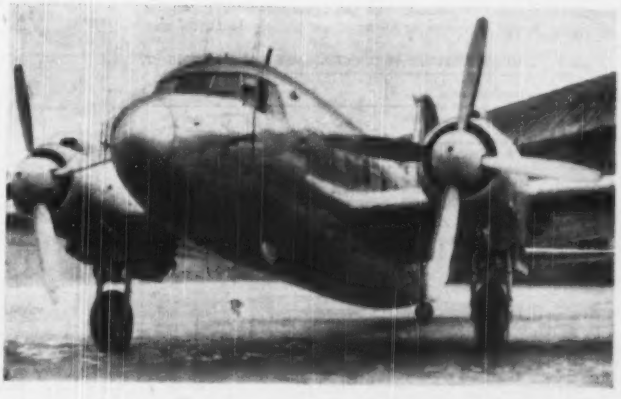
On large aircraft equipped with tricycle undercarriages, the wing can be positioned at an angle of incidence reasonably close to the incidence required for landing safety-speed. Furthermore, the elevator can be made powerful enough to cope with the ensuing pitching moment, providing that an appropriate fore and aft location of the undercarriage relative to the c.g. is used (Fig. 3). The fact that braking airscrews can be used on tricycle types without danger of tipping back is due to the fact that the resultant of the horizontal inertia forces is not far vertically from the thrust and drag line, and the magnitude of these factors is equal during the deceleration.

In making a comparison between nosewheel and tailwheel undercarriages from the structural viewpoints, it has to be admitted that the nosewheel type is the more difficult to deal with. Having a shorter wheelbase, it has to withstand greater loads—more especially in landing cases, when the loads can be as much as twice those that a tailwheel assembly would be called upon to accommodate. The full brake-application load-capacities specified by the Air Registration Board for tricycle undercarriages are, in fact, worse than the manœuvring loads on aircraft equipped with tailwheel landing gear. With high-wing aircraft, for example, the taxying loads are 45 per cent higher for a tricycle layout than the manœuvring loads on a tailwheel type. As to landing loads—which are usually the most critical—although the A.R.B. vertical velocities of descent are the same for both types of undercarriage up to a stalling speed of 50 m.p.h., the energy absorption coefficients are approximately 100 per cent higher for the nosewheel type. It is, in fact, true to say that nosewheel loads are, in general, about double the value of tailwheel loads when the leg lengths are the same. But the very fact that nosewheel struts are, as a rule, considerably longer, means that the loads they are called upon to bear are, at the very least, twice as large as those for the corresponding tailwheel units.

Other structural considerations involve static and dynamic stability on the ground. Here, it must be said that, owing to the main wheels trailing aft of the centre of gravity, the tricycle layout—with, of course, a castoring nosewheel—is inherently statically stable, whereas the tailwheel undercarriage is inherently statically unstable. Consequently, the nosewheel undercarriage is essentially an anti-ground-loop configuration (Fig. 1) as compared with the tailwheel layout (Fig. 2). An examination of the tricycle aircraft in side elevation also



Figs. 1 and 2. Whereas with a nosewheel undercarriage (above) the sideforce moment arm about the c.g. gives a stabilizing effect, with a tailwheel undercarriage (right) it has a de-stabilizing action.



The immediate post-war Viking makes use of the conventional tailwheel configuration of its Wellington and Warwick forebears.

NOSEWHEEL or TAILWHEEL? . . .

makes it apparent that it is an anti-bounce and anti-nosing-over gear (Fig. 3) by contrast with the tailwheel layout (Fig. 4). On the score of dynamic stability, which involves such high-frequency phenomena as shimmy (lateral oscillation) and porpoising (pitching oscillation), the nosewheel undercarriage does not show to advantage against its tailwheel counterpart. The shorter wheelbase not only reduces the damping moment arms, but also incurs higher aircraft moments of inertia about the wheels.

There are, however, various ways of suppressing, if not eliminating these troubles.

Porpoising can be mitigated by increasing the wheelbase or the stiffness of the shock-absorbers, or by decreasing the

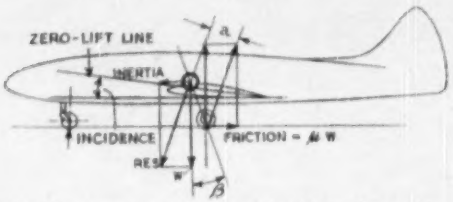


Fig. 3. The force vector diagrams shown here makes it clear why a tricycle undercarriage is stable in pitch after touch-down.

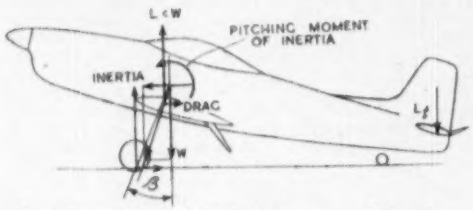


Fig. 4. By contrast with Fig. 3, the force vector diagram for a tailwheel type moving on the ground shows instability in pitch.

height of the undercarriage. Shimmy can be reduced by the introduction of anti-swivel damping such, for example, as is provided by hydraulic steering, by hard twin-tread tyres, by twin-wheels on a common axle, or by changing from an inclined to a vertical swivel axis on a twin-wheel type.

The fact that a nosewheel assembly is almost inevitably required to bear about twice the loads of a tailwheel unit means, almost equally inevitably, that it comes out at least twice as heavy as a tailwheel unit of the same height. There are, however, other weight penalties as well. On a multi-engined aircraft, for example, the front fuselage is required to accommodate the heavy nosewheel loads—if ditching loads are omitted—whereas tailwheel loads can

TABLE I: UNDERCARRIAGE PERCENTAGE OF ALL-UP WEIGHT

Tailwheel Aircraft			Tricycle Aircraft		
	Percentage a.u.w.			Percentage a.u.w.	
Type	u/c.	Struct.	Type	u/c.	Struct.
Tudor I	4.0	27.8	Dove	4.2	27.8
Tudor II	4.0	32.1	Ambassador	4.8	32.1
Tudor IV	4.0	28.7	Hermes IV	4.1	28.5
Tudor V	4.0	31.5	Marathon	5.1	32.0
York	4.9	30.1	Prince	5.2	32.1
Wayfarer	5.2	38.0	Convair 240	3.7	27.9
Prentice	5.2	47.5	DC-4	5.7	26.9
Proctor	4.9	40.4	Canadair DC 4M-2	5.3	25.3
Viking	3.8	30.2	DC-6	4.8	24.8
Dakota	7.0	33.6	DC-7	6.2	29.5
			Stratocruiser	5.1	28.0
			Constellation	5.1	30.4
			Constellation IIB	4.4	27.2
			Martin 2-0-2	4.5	27.8
			Rainbow	5.6	25.9

Mean value for tailwheel undercarriage = 4.8 per cent of all-up weight.
Mean value of tricycle undercarriage = 4.92 per cent of all-up weight.

TABLE II: DESIRABLE UNDERCARRIAGE DESIGN DIMENSIONS

Dimension	Nosewheel only	Tailwheel types
(1) Zero lift incidence with all wheels on ground (Fig. 3 and 4).	Not less than 5 deg. to prevent "jump take-off.	Not less than 2 deg. below stalling incidence, to prevent ground-looping.
(2) Angle Beta between vertical and line joining c.g. to tyre contact centre.	Not less than 15 deg. to prevent tip-back tendency.	Not less than 20 deg. to prevent nosing-over and not more than 25 deg., to prevent ground-looping.
(3) Nose- or tail-wheel loads as percentage of a.u.w. (Fig. 5).	10 to 20 per cent. for a.u.w. below 10,000 lb.; 8 to 16 per cent for a.u.w. less than 20,000 lb.; 4 to 13 per cent for a.u.w. over 20,000 lb.	4 to 11 per cent. average.
(4) Wheelbase as percentage of aircraft length.	Not less than 33 per cent.	37 per cent average.
(5) Wheel track as percentage of wing span.	28 per cent.	Not more than 30 per cent to prevent ground-looping.

easily be dissipated in the rear fuselage structure which, in any event, has to be made strong enough to accommodate empennage loads. On this basis alone, therefore, the fuselage of an aircraft equipped with a tailwheel undercarriage should be lighter than that of an aircraft with tricycle landing gear.

All in all, the weight penalty *on the introduction* of a nosewheel undercarriage on a given aircraft may vary from 0.5 to 2.0 per cent of the all-up weight, and this in turn incurs a decrease of payload from 2 to 8 per cent—a serious loss. If, on the other hand, an aircraft is designed from the outset for a nosewheel undercarriage, it is possible to use a higher wing loading and, therefore, a lower structure weight, by being less demanding in taxying, take-off and landing. This factor may offset or even overcome altogether the weight penalty involved in the use of a tricycle undercarriage. In Table I is shown how small, in fact, are the final weight differences for both basic types of undercarriage. The fact that most of the aircraft included in the table are transport types is ascribable simply to the lack of other data at present available.

In order to provide some approximate undercarriage design data for this article, the characteristics of some 36 British, American and German undercarriages on civil and military aircraft have been examined. The main values of these data are presented in Table II and in amplification of some of the various items it is of interest that, regarding item (i), the wing incidence on the Marauder 3 was increased by 3 deg to improve the take-off. By the same

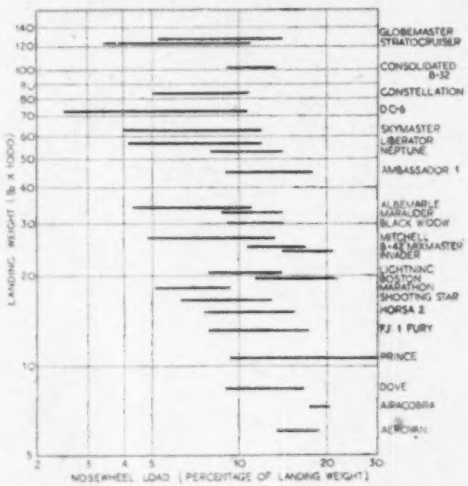


Fig. 5. This chart is of interest in showing nosewheel loads as a percentage of landing weight plotted against landing weight for a variety of types, most of which are, necessarily, American.

token, the nosewheel leg on the Scandia has been lengthened, and the take-off characteristics improved. The "jumping-type" take-off is a concomitant of insufficient lift and, therefore, too high a fly-off speed. The pilot has to rock the aircraft to a higher incidence by the application of a good deal of elevator, whilst the main wheels are still on the ground. In this condition, the main wheels are providing the only friction force with the nose-down moment about the c.g., and when the wheels do finally leave the ground, the pilot is presented suddenly with too much elevator-up for safe climb. This effect is most usually found on aircraft in which the c.g. is at a high level, or in which the main wheels are too far back relative to c.g.

The Northrop YC-125B Raider is remarkable among modern types not only for its use of three engines, but also for the extremely short wheelbase of its undercarriage.

So much for the few design data. But what about design criteria for the choice between a nosewheel and a tailwheel undercarriage layout? From the arguments presented, the conclusion may be drawn that the tricycle undercarriage should be used on every new aircraft with, perhaps, the following exceptions:

(i) Very light, slow-landing types which do not require a great deal of piloting skill, or aircraft required to operate on rough or soft surfaces. In the latter instance, the nosewheel tyre would need to be unduly large in order to prevent digging-in on take-off or landing. Even so, there is a design trend to introduce tricycle undercarriages in these classes.

(ii) Single-(radial)-engined tractor-airscrew aircraft, especially carrier-borne or training types which, owing to the engine being close to the c.g., could have only an unreasonably short wheelbase. But the latest U.S. trainers are mostly tricycle types.

(iii) Special aircraft, e.g., racing types, where weight economy and top speed performance is of primary importance, and where the safety and comfort of the pilot and the ease of control are secondary.

For all other types, especially military and transport aircraft, the nosewheel undercarriage has become a "must." The trend can already clearly be seen in Britain and in France, where various aircraft manufacturers are modifying their originally tailwheel-equipped types to take a nosewheel undercarriage, e.g., the Vickers Viking and Handley Page Hermes. As far as the U.S.A. is concerned, the writer cannot recollect even one civil transport aircraft in production, designed during or since the war, which is equipped with a tailwheel landing gear. [The Northrop Raider and possibly the Douglas Super DC-3 might be mentioned.—ED.] In the personal aircraft field, only two out of nine aircraft in quantity production in America have tailwheel undercarriages, and the best known light aircraft, namely the Bonanza, Navion and Ercoupe, are tricycle-equipped.

It has not been the intention in this article to prove that the majority is always right; nevertheless, the general trend toward the use of a nosewheel undercarriage would seem to confirm that, in spite of its shortcomings, and design difficulties, it has definitely become a safer and more useful type.

MILITARY VARIANTS

MENTION is now permitted of five new variants of standard Service aircraft, as noted below:

Fairey Firefly A.S.6.—As its designation denotes, this mark of Firefly is for anti-submarine operation. It is identical with the A.S.5 as now in service, except for revision of the arrangements for carrying certain types of external stores.

Bristol Brigand T.4.—An advanced-trainer development of the Brigand bomber.

Westland-Sikorsky Dragonfly H.C.2.—Officially classed as a communications aircraft, this military version of the civil S-51 helicopter is powered with a Leonides 50 engine.

de Havilland Mosquito P.R.35.—An adaption of the Mosquito B.35 bomber equipped to operate as a special night-photographic aircraft.

Handley Page Hastings Met.1.—A specially equipped development of the Hastings military transport for long-range meteorological reconnaissance. It may be remembered that the Halifax bomber was similarly developed into the Halifax Met.6.

ROYAL ENTRY FOR KING'S CUP

OVER forty aircraft, with speeds ranging from 130 to 350 m.p.h., have already been entered for this year's King's Cup Race, which is to be flown from Wolverhampton Airport on June 17th. All these entries are subject to official acceptance by the race committee of the Royal Aero Club.

In issuing these preliminary details, the Royal Aero Club is gratified to be able to announce that H.R.H. Princess Margaret has graciously entered a Hawker Hurricane, which is to be flown by G/C. Peter Townsend. (Last year, it will be remembered, the Princess entered a Miles Whitney Straight, in which Townsend only just failed to qualify for the final.)

One of the fastest entries, a Supermarine Spitfire, is to be flown by a woman, Miss R. M. Sharpe, who is a test pilot for W. S. Shackleton, Ltd. Two other women pilots, Mrs. M. M. Rendall, ex-A.T.A., and Lady Sherborne, have entered. The former will fly a Rapide and the latter a Vega Gull. A two-seat Spitfire Trainer is also entered.

Last year's winner, J. N. Somers, has again entered his Gemini, and the holders of second and third places last year, R. Paine and A. L. Cole, will again be flying their Miles Hawk Speed Six and Comper Swift respectively. There are six twin-engined entries, a D.H. Dove from Tanganyika, a Rapide and four Geminis. The Miles *marque* is represented by no fewer than 23 of the 40 entries. The smallest aircraft competing will be two 85 h.p. Comper Swifts.

The race will consist of three laps over a four-sided course, starting and finishing at Wolverhampton. The course is 100 km (slightly over 62 miles) in length and the total distance will be approximately 186 miles. The course has been fixed at 100 km so that any good times set up may be submitted to the F.A.I. for confirmation as world class records in this closed-circuit distance category. A full list of entries will be issued shortly.

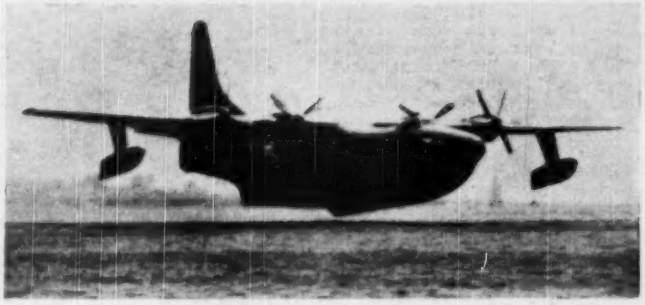
AERO GOLFING SOCIETY NEWS

THE spring meeting of the Aero Golfing Society was played at Sunningdale Golf Club, near Ascot, on April 18th, when, in spite of extremely bad weather, there was a good attendance. The morning competition over 18 holes medal play for the Instone Challenge Cup (presented by the late Sir Samuel Instone in 1923) was won by P. Q. Reiss, playing off 8 handicap with a net score of 78, and the runner-up, who was awarded a Society Tankard, was C. P. M. Hunting with a score of 86–7=79. There were 26 entries.

In the afternoon, with improved weather conditions, the competition was 18 holes four-ball best ball medal, and resulted in a tie with a score of 70 between J. A. T. Ryde, playing with C. P. M. Hunting, and C. Boyes, playing with R. R. S. Cook. The former couple were judged the winners with a better score on the last nine holes and were each awarded a Society Tankard.

The first summer meeting of the Aero Golfing Society will be held at St. George's Hill G.C., near Weybridge, on Tuesday, May 16th, when the principal competition will be that for the *Flight* Challenge Cup. It is worthy of mention that the captain of the St. George's Hill Club this year is G/C. P. W. S. ("George") Bulman, C.B.E., M.C., A.F.C.

HERE and THERE



UNDER WAY: First take-off of the Convair XPSY-1 turboprop-powered flying-boat which—as reported overleaf—has now begun initial flight trials.

Six N.Z. Race Entries

THE Canterbury International Air Race Council announces a total of five provisional entries for the transport handicap section of the 1953 England-Christchurch (New Zealand) race. Four airlines have entered—B.E.A., B.O.A.C., K.L.M. and Qantas—together with Armstrong Whitworth (who have nominated the Apollo). The first entrants, de Havilland Aircraft, Ltd., have not yet nominated the section in which they will compete. Reports from America indicate growing U.S. interest in both transport and speed divisions of the race.

The Last Word?

ALTHOUGH there is no intention of re-opening Project Saucer, the official investigation which ended three months ago, the U.S.A.F. is to continue to evaluate through normal field channels any "substantial reports of any unusual aerial phenomena." More recent analysis of further "flying saucer" reports has confirmed the sceptical conclusion that such manifestations resulted from "misrepresentations . . . mass hysteria, or hoaxes."

Expert Adviser

WITH the concurrence of B.O.A.C., to which company he is an honorary technical adviser on jet development, A. Cdre. Sir Frank Whittle has agreed to act as a consultant to Power Jets (Research and Development), Ltd., in all matters, other than civil aviation, relating to gas turbines. Power Jets, originally formed in 1936, is now responsible for holding and exploiting in the national interest, patents resulting from Governmental gas-turbine research and development.

Airway's Armorials

FIRST borne by the Vickers Viscount, although originally designed in 1949, B.E.A.'s new coat of arms is now being displayed on the turboprop liner's demonstration tour throughout Europe. Heraldically, the blazon reads: "Argent, a fesse gules between three astral crowns azure; and for the crest in front of a sun in splendour rising or, a swift volant sable." A "decoded" explanation is: On a white field, a red band between three blue astral crowns. The crest is a swift flying in front of a golden sun rising in splendour. The motto means "Key to Europe."

Garden Party Performers

IT is hoped that the Fouga Cyclone jet-powered glider may make its first English appearance at the R.Ae.S. Garden Party at White Waltham on May 14th. Already scheduled to appear are the French Patrouille D'Etampes, renowned slow-flying aerobatic team, the Fokker S-11 Instructor and the Hoppicopter. The programme will include the names of some 40 aircraft, mostly light types and many of great historic interest.

French Jet Airliners

A FRENCH counterpart to the Nene-Viking is expected to make its first flight within a few weeks—a research version of the SO 30P Bretagne medium-range airliner with two Hispano-built Nenes.

Air France will shortly take delivery of the first batch of 30-passenger Bretagne 1s, 40 of which are on order. Two aircraft of this type are at present undergoing endurance tests, under Air France supervision, on commercial service. Transporting fruit and vegetables from France to the United Kingdom, they are accumulating the 500 hours' flying necessary before award of a C. of A. for passenger-carrying.

Avengers for R.C.N.

CANADA has taken further steps towards standardization of North American military equipment. Arrangements have been completed for purchase, from the United States, of a number of Grumman Avenger anti-submarine aircraft, presumably war-surplus models.

Avengers will equip Nos. 825 and 826 Squadrons of the Royal Canadian Navy. Latest information is that these units are at present equipped with, respectively, Firefly 5s and Sea Fury 11s. The adoption of a wartime torpedo-bomber therefore appears retrogressive. However, the Canadian Defence Minister points out that the Avenger is "admirably suited

MAKING HISTORY: When the Avro Jetliner carried the first "jet mail," at 403 m.p.h., between Canada and the U.S.A., the consignment included a letter—of which the cover is shown (below)—from Mr. W. N. Deisher (Avro Canada vice-president) to Sir Roy Dobson. The letter says, "It marks a great achievement that this flight should be made by the Avro Jetliner, in the construction and development of which you, as president of A. V. Roe Canada, Ltd., have been so much concerned." Members of the crew were (left to right) Bill Baker, engineer; Don Rogers, pilot; Michael Cooper-Slipper, co-pilot.

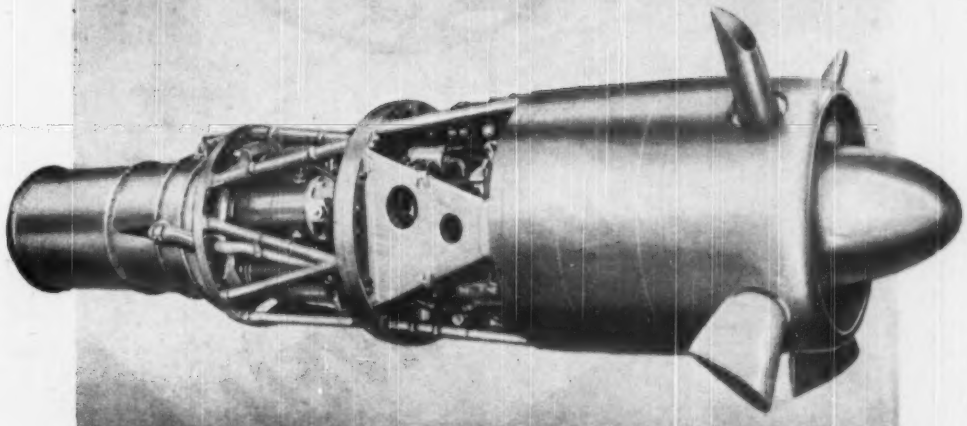
NAPIER NAIAD

PROPELLER TURBINE ENGINE

TOTAL E.H.P. – 5500

WEIGHT – 1095 LBS.

DIAMETER – 28 INCHES



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HERE AND THERE . . .

to the modern concept of anti-submarine warfare," and that its adoption by the R.C.N. will facilitate squadron exchange in joint U.S.-Canadian carrier-training.

Helicopter Ambulance for T.T.?

THE Auto-Cycle Union is considering the possibility of chartering an air-ambulance helicopter for this year's T.T. races on the Isle of Man. Use of a helicopter, it is thought, might avoid dangerous delay in providing medical assistance should an accident occur in an inaccessible part of the island.

Spreading Their Wings

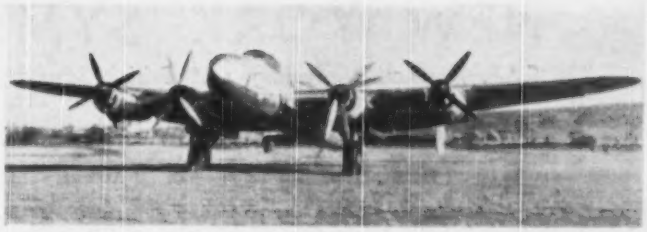
TWO Russian TU-2 light bombers with wings of considerably increased span are illustrated in the April issue of the official *Aircraft Recognition Journal*. The publication comments that this new version of the TU-2 is probably intended for high-altitude, long-range reconnaissance duties.

Adastral Players Perform

PRODUCTIONS by the Adastral Players (the M.C.A. and Air Ministry Dramatic Society) have come to be accepted as annual social events for the two Ministries' staffs. This year's play, the comedy *And No Birds Sing*, will be held at the Scala Theatre on May 2nd and 3rd at 7.15 p.m. Music will be provided by the R.A.F. Central Band.

Convair Boat's First Flight

THE Convair XP5Y-1 flying-boat — designed for anti-submarine patrol and rescue duties with the U.S. Navy—made a first flight of 30 minutes at San Diego, California, on April 18th. Powered by four Allison X-30-A-4 coupled turboprops, the new Convair is the first American aircraft to rely solely on turbine-airscrew power. Its gross weight is approximately 120,000 lb. and it has a crew complement of eleven.



TWO OF EACH: One of the latest in a long line of Rolls-Royce flying test-beds is this Lancastrian, modified to take two Griffons, driving contraprops, as installed in the Shackleton. Outboard are two Merlin 620-series civil power-plants.

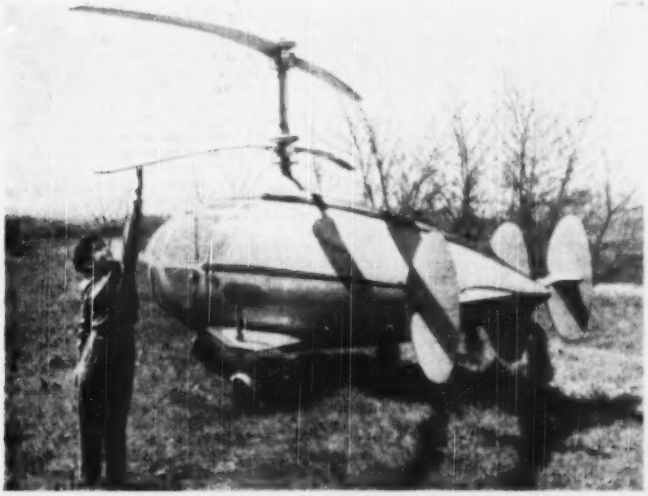
Exhibition Ship

THE Admiralty is lending the 16,000-ton carrier *Campania* to the Festival of Britain Organization for use as a travelling exhibition ship. She will begin a tour of British ports in April, 1951.

P. and W. Power-Unit Progress

THE annual report of the United Aircraft Corporation reveals that its Pratt and Whitney engine division—the only U.S. manufacturer producing both jet and piston engines—has now received orders for a total of 1,401 J-42 and J-48 turbojets (developments of Rolls-Royce Nene and Tay units). Additionally, original P. and W. designs—both turbojet and turboprop—have reached the bench-running stage.

The Corporation's activities also include manufacture of the 3,500 h.p. Wasp Major, 1,000 of which have now been produced. An order was recently given by the U.S.A.F. for 356 Wasp Majors of an "advanced and more powerful design"—possibly the compounded version. Another United Aircraft division, Hamilton Standard, is working on design and development of supersonic propellers.



ROTARY ROMAN: Possibly the smallest helicopter in existence, this 80 h.p. Brondetti two-seater was exhibited recently in Rome. Intended range is 400 miles, but whether it has made its first flight is as yet unknown.

NEWS IN BRIEF

THE 1950-51 edition of the *Air Touring Guide to Europe* is now available, and may be obtained from the R.Ae.C. Air Touring Department at Londonderry House, London, at a price of 7s 6d (by post, 8s).

* * *

Mr. J. W. Kinchin has been appointed a director and chief engineer of Girling, Ltd., of Tyseley, Birmingham.

* * *

A new wetting agent is now incorporated in "Penetreen 50," a colloidal-graphite penetrating oil made by Edwards Mfg. Co., of Birkenhead, Chester.

* * *

Mr. D. C. Embley, advertising and publicity manager of High Duty Alloys, Ltd., is shortly to leave in order to take a similar post with H. W. Carter and Co., Ltd., Coleford, Glos.

* * *

A comprehensive and attractively produced catalogue of "Cutanit" cemented-carbide tips and tools is published by William Jessop and Sons, Ltd., Brightside Works, Sheffield.

* * *

Lifting of paper restrictions will enable *Amateur Photographer*, from its April 26th issue, to appear in new and improved format and with its editorial content increased by between 30 and 40 per cent.

* * *

Sir Frederick Handley Page has put Radlett airfield at the disposal of the St. Albans Model Aero Club for their fifth annual rally on May 17th. Last year some 500 entries were received from 75 clubs and an attendance of over 10,000 was claimed.

* * *

Coventry Climax Engines, Ltd., announce three new appointments to their Board. Mr. Percy W. Cooper, secretary, becomes director and secretary; Mr. Charles A. Minns, works manager, is made works director; and Mr. John M. Morris, general sales manager, is appointed sales director. Mr. Minns is succeded by Mr. Frank Cotton.

* * *

Winners of the two awards recently made under the Spitfire Mitchell Memorial Fund scholarship scheme are both employees of Vickers-Armstrongs, Ltd.; Alan R. Blake is at the Supermarine Works at Hursley Park, and D. J. Leahy is an apprentice at Weybridge. The scholarships will enable the recipients to study for their B.Sc. at Southampton University College.

NEW YORK SYMPOSIUM

The S.A.E. Aeronautic Meeting : A British Summary of Gas-turbine Progress

LAST week the Society of Automotive Engineers held its important Aeronautic Meeting and Aircraft Engineering Display in New York. Three days of lectures and discussions at the Statler Hotel culminated in the dinner on Wednesday, 19th April, and on Thursday there was an inspection trip to Idlewild, New York's International Airport, where the Avro C.102 Jetliner made its American debut and a number of American aircraft, power plants, and airscrews were on view.

On the Monday, Mr. R. N. Dorey, of Rolls-Royce, Ltd., dealt with "The Extended Service Life of Propeller Turbine Engines," and Mr. J. W. Bailey, of the Allison Division, General Motors Corporation, described "Service Experiences with Turbojet Engines." In the afternoon, Mr. Scott Flower, of Pan American Airways, read a paper entitled "A Review of a Year's Operation of the Curtiss-Wright Dehmel Flight Simulator."

On the Monday evening there were presentations of Wright Brothers awards, and a lecture on the work of the two pioneers as aeronautical engineers, while to mark the occasion there were exhibits of relics of their activities—a replica wind tunnel, the actual engine and airscrew, working drawings, reference books, and Orville Wright's pilot's licence No. 1.

Air transport problems occupied most of the Tuesday, and the programme was, somewhat startlingly, introduced with the catchline "Air Transportation After 1955—Whoosh!!! Why, with what, and how?" In the evening the case for the turbojet was discussed by Mr. Winnett Boyd, of A. V. Roe, Canada, designer of the Chinook and Orenda, and the case for the turboprop by Mr. R. M. Hazen, Allison Division of General Motors.

Mr. Charles Froesch, general chairman of the Panel, introduced Mr. G. Geoffrey Smith, editorial director of *Flight*, who had been invited to give an informal survey of the gas-turbine position in Britain. His observations are printed below. Following the talk, the Shell film of the S.B.A.C. Display at Farnborough was screened, and caused great interest among the audience.

Aerial photography was the principal subject for the Wednesday morning's papers, and in the afternoon standardization was discussed.

G. GEOFFREY SMITH'S SUMMARY

FIVE years ago, in New York [said Mr. Geoffrey Smith], I pointed out that in England aircraft turbine development was entrusted mainly to manufacturers of aircraft piston engines, while in America initial development was given to builders of steam turbines. Intimate knowledge of installation problems and the importance of aircraft experience of power units at high speed and altitude were, we felt, prime considerations. Whether we made the better choice, and whether it gave Britain an initial advantage, you will judge for yourselves.

But let us acknowledge that both countries have made enormous progress in gas-turbine power generation for various purposes, apart from aircraft. In a comparatively brief period gas turbines have been developed to a very high degree of excellence and efficiency, challenging all other forms of accepted power units. From comparatively simple compressor-turbine jet units, turbines tend to become more complicated as they continue to grow in power output. In striving for greater efficiency, the simplicity of the original Whittle jet unit is being sacrificed.

Cost of Development.—To design, build and develop a modern high-power aircraft turbine to the stage of reliable service use may nowadays cost as much as £3 to 4 million ($8¼ to 11 million) and take three to four years. Thus, it is apparent, there is no possibility of lone-hand brainwaves and basement production. It requires a large organization and access to most extensive development and test facilities. No company can afford to produce a specifically civil type unless it has potential military utility and consequently receives military backing. Endurance testing of components on the rig entails a big expenditure of time and money.

Recent Developments.—Co-operation between our two countries on specific types can effect great economies. As with you, the major emphasis in England is on new types of axial-flow turbojets for military aircraft. We must congratulate you on the Allison XT-38 unit, which is exceptionally slim, and also on the North American F-86 swept-wing fighter with the General Electric TG-190 axial unit, of which we have good reports. We are also gratified at the healthy progress in Canada with the Avro Canada Chinook and Orenda turbojets.

In Britain, attention is focused on the Rolls-Royce Avon and Armstrong Siddeley (originally Metropolitan-Vickers) Sapphire. These are at present our most powerful types and may be expected to figure largely in our jet-bomber programme.

It has always been known that small frontal area was desirable, but as operational speeds are raised this factor becomes of critical importance.

In our Meteor twin-jet fighter Rolls-Royce Avons of 6,000 lb thrust give a rate of climb of 10,000 ft/min, i.e., 40,000ft in 4 min. With the aid of water-methanol injection and afterburning we can claim to be on the threshold of the achievement of 10,000 lb thrust from a single unit. Indeed, as an English wit put it, by the combination of a shot in the arm and a kick in the pants you can double the thrust. The centrifugal type has not been abandoned for military aircraft. The de Havilland Ghost, for example, is being actively developed in the Venom high-altitude fighter, and there is the Rolls-Royce Tay of 6,250 lb thrust.

Specific Consumption.—The excellent papers presented to this meeting have almost invariably touched upon the importance of fuel consumption, as affecting range and not cost. Present consumption rate of turbojets is admittedly too high and consequently narrows the field of utilization. But this is not necessarily a permanent handicap. Continued research into combustion problems has led to steady reduction of rate. For instance, by the improvement of combustion technique and auxiliaries alone, in three years the rate of fuel consumption has been reduced by 9 per cent in the Joseph Lucas laboratories.

Combustion Research

It is confidently expected that current investigations into spray characteristics, the size of the droplets and distribution of atomized sprays—and also aerodynamic, mechanical and metallurgical advances improving the thermal efficiency—will effect further benefits. This progress will be supplemented by many improvements here and there, dictated by constant research and experiment with individual components, so that the specific rate of consumption may be reduced by a further 15 to 20 per cent in the next three years. We are aiming to achieve a figure of 0.8 lb/hr/lb at sea-level static and, say, 1.1 lb/hr/lb at 600 m.p.h. in the stratosphere.

Although important, the specific consumption of the bare power unit is not necessarily the best indication of its suitability for a particular duty. One or two previous speakers comparing turbines with piston engines tended to disregard what is saved in the matter of auxiliary services. The turbine power plant which can furnish cabin pressurization and de-icing (and, incidentally, save 500-600 lb weight of independent auxiliaries) shows an advantage in this respect over the piston engine. In other words, the main compressor of a turbine provides automatic auxiliary services at an appreciable saving in weight.

For a particular aircraft it would be more informative to quote the rate of fuel consumption "for all purposes," as is the practice in shipping circles. The day has gone when, in high-altitude turbine-propelled aircraft, we quote bare engine fuel consumption: we must recognize what is saved in the matter of auxiliaries and thus offset differences in fuel consumption. It must be confessed in this regard that axial-flow compressors are more "touchy" in being bled for these services than is the centrifugal type.

Compressor Types.—Component efficiency of the axial type is higher at, say, 88 per cent: a higher compression ratio can

be employed and consequently make possible a lower specific rate of fuel consumption (say, 12 to 15 per cent lower). Also, its relatively smaller diameter permits tighter installation and reduced frontal area, which diminishes aerodynamic drag, an all-important consideration at high Mach numbers which may dominate the choice. The centrifugal compressor is cheaper than the axial type to develop, to produce, to maintain and is certainly of more robust construction and less vulnerable to foreign bodies or icing. Its efficiency can be put at 79 or 80 per cent.

Although much effort is being lavished on the axial type, it must be acknowledged that the civil airliners now flying and doing real work—the de Havilland Comet, Avro Canada Jetliner and Vickers Viscount—are fitted with centrifugal compressor units.

High-energy Ignition System.—Typical of our detailed research into particular problems affecting aircraft turbine operation is the high-energy ignition system developed by the Royal Aircraft Establishment. This has enabled us to dispense with the familiar torch igniter and its auxiliary fuel spray, as the electric discharges it produces at the rate of about one per second are of such high energy and short duration that each can by itself create ignitable conditions in the combustion chamber. Each discharge can vaporize a sufficient quantity of the main fuel spray and then ignite a sufficient volume of the resulting mixture to produce a general "light-up."

"Light-up" Problems

It was soon found that erosion of the electrodes of the orthodox high-voltage igniter plug was too rapid and it was decided to use a surface-discharge type of plug with a large electrode area. This consists of two circular electrodes of heat-resisting steel separated by an annular gap of 0.02in in which mica is tightly compressed and made flush with the electrode surfaces. A thin layer of carbon is deposited on the mica surface and the plug is positioned in the combustion chamber so as to maintain this deposit during normal operation.

In the ignition system an induction coil, operated by a vibrator from a 24-volt d.c. supply, repeatedly charges a condenser through a sealed spark gap until the condenser voltage increases to about 2 kV. The condenser then discharges through a 2 kV sealed spark gap, an inductance, and the surface discharge plug, all in series.

The duration of the discharge is of the order of 50 microseconds and the peak current is about 1,500 amp. The total weight of the equipment, including a screened plug lead, is about 10 lb.

The system has successfully ignited aircraft-turbine combustion chambers in the test house over a range of limiting combustion conditions, from high pressures equivalent to those at high flying speed at low altitudes to low pressures encountered at high altitudes. In actual flight, successful relights have been obtained on several turbine units at altitudes up to about 35,000ft. This system is not yet in general Service use.

Thrust Augmentation.—America seems to be somewhat ahead of us in the application of afterburning to standard aircraft. In Britain we are developing afterburning—or reheat, as we are urged to term it—as a temporary power-boost system for fighters and bombers as demonstrated at the last Farnborough Display. With increased temperature it gives greater percentage efficiency—a theoretical 34 per cent at 1,500 deg K.

For civil aircraft, particularly at take-off boost, we incline towards water-methanol coolant for the compressor, as afterburning equipment is calculated to impose a penalty of 2 to 3 per cent on the cruise consumption. We estimate a maximum benefit of from 10-12 per cent can be gained from water-methanol injection. If more is obtained it is regarded as an indication that the characteristics of the compressor and turbine are poorly matched.

Both water-methanol injection and liquid-fuel rocket motors have been developed to assist the take-off of the de Havilland Comet when fully loaded from tropical or high-altitude runways. During the various tests throughout the winter, the record-breaking Comet has been successfully flown for 5½ hours at a stretch with standard tankage. The next specimen will have more tankage in the wings and, incidentally, a bogie undercarriage. With improvements in the Ghost turbines, Major F. B. Halford estimates another five per cent reduction on published figures of specific fuel consumption. Present tests have been carried out at an altitude of 35,000ft to 40,000ft, but the Comet will go to 45,000ft.

Turboprops.—British faith in relatively low-powered turboprops for civil use—typified by the Armstrong Siddeley Mamba and Rolls-Royce Dart—is unshaken. We are pleased with the result of the icing trials of the Dart and the performance of this unit in the Vickers Viscount as adopted by British European Airways.

For our largest civil aircraft, the Bristol Brabazon landplane and the Saunders-Roe Princess flying-boat, we are to use the Bristol coupled multi-stage Proteus, which has, unfortunately, been delayed by improvements now being introduced. It is of interest to note that in America you are working on somewhat similar lines. I refer to the installation of Allison XT-40 units in the Convair XP5Y-1 long-range flying-boat.

The first turboprop likely to be in regular military use is the larger Armstrong Siddeley Python now in production for carrier-borne strike aircraft. Valuable experience is also being accumulated with the coupled Mamba in new anti-submarine aircraft. For this duty the coupled turboprop, offering cruising economy and high maximum power for closing on the target, appears ideally suited.

We expect a progressively stronger challenge from America in the turboprop fields.

Technical Co-operation.—Enormous benefit is to be obtained by technical co-operation between our countries. It existed even before Pearl Harbour, when our first Whittle jet unit was flown over to America for the General Electric Company. The Rolls-Royce and Pratt and Whitney arrangement is another excellent example of mutual aid. It was recently stated by a Pratt and Whitney executive that some members of their technical staff knew their way around the Rolls-Royce plants better than around their own!

We might, I think, consider the experimental installation of our most advanced turbine power units in your equally advanced airframes.

Security considerations, admittedly, do not make technical liaison easy, but they must not be allowed to stifle it.

As turbine power units become more complicated, the incubation period between initial inception and delivery for service tends to lengthen. Continued technical liaison can materially reduce this critical period, and have the combined effect of strengthening our positions in the van of engineering progress and provide added security in a troubled world.

Standardization of all minor parts and accessories should be pursued so long as it is not permitted to impede design, but we should guard against any attempt to standardize ideas.

COMET'S LATEST RECORD

London-Cairo at 425 m.p.h. as Preliminary to Tropical Trials

ON Monday last, April 24th, the de Havilland Comet left England for tropicalization tests in Africa and broke the London to Cairo record in doing so. Leaving Hatfield at 6.47 a.m., the aircraft reached Farouk Airport 5 hr 10 min later, achieving a speed of 425 m.p.h. over the distance of 2,196 miles. This stage-length is slightly longer than that between Prestwick and Gander—2,116 miles. The actual inter-city distance, considered for record purposes, is 2,183 miles. The new performance—which, of course, is subject to F.A.I. homologation—breaks the 6 hr 35 min 40 sec (334.3 m.p.h.) record set up by S/L. Neville Duke in a Hawker Fury last February.

By comparison with its previous high-speed long-distance flights (to Castel Benito, Rome and Copenhagen), the Comet carried a much heavier load of 8,000 lb. In airline service, with the cabin fully furnished, this would represent 34 passengers and their baggage, two stewardesses, and all the necessary amenities for a 2,200-mile stage-length with stand-off allowances. Although the Comet was thus carrying a very useful equivalent payload, its weight on take-off from Hatfield's single runway—short by modern airport standards—was below the normal figure of 105,000 lb.

The pilot was G/C. John Cunningham, with Mr. Peter Bugge as second officer and a flight crew of four. Also on board were Sir Geoffrey de Havilland and other executives of the enterprise—Mr. R. M. Clarkson, Mr. C. T. Wilkins and Mr. A. T. Widgery—together with Capt. Alderson (a senior pilot of B.O.A.C.) and a ground crew of five who will service the machine during its trials. In addition, a larger-than-usual load of test equipment was carried.

During the trials, which are expected to last two or three weeks, the Comet is operating from Eastleigh (Nairobi) and Khartoum to assess its performance in tropical heat and at high altitudes. It flew on to Nairobi on Tuesday, covering the 2,200 miles in 6 hr 9 min. The airfield at Nairobi is 5,370ft above sea level and 1 deg 18 min south of the equator. Since its first flight last July the Comet has logged some 250 hr on 173 flights.

THE PRIVATEER INCIDENT

Washington's Protest to Moscow: "Violation of International Law"

FOLLOWING a prolonged but unfortunately unsuccessful search for the United States Navy four-engined Privateer aircraft which disappeared in the Baltic area on April 8th, the United States government delivered a Note of protest in Moscow on April 18th. Previously, a Russian Note had stated that an American aircraft—which they described as a B-29—had penetrated the territory of the Soviet Union to a distance of 21 km. Additionally, it was alleged that the aircraft failed to comply with the demands of a flight of Soviet fighters sent to intercept it and opened fire on them. As a result, continued the Russian Note, "an advanced Soviet fighter was forced to open fire in reply, after which the American plane turned towards the sea and disappeared." This was at 5.30 p.m., Moscow time, on April 8th.

The firmly worded American Note stated that the only American military aircraft which was in the air in the Baltic area on April 8th was the U.S.N. Privateer which disappeared on that date and that no trace of its crew had since been found. The aircraft was wholly unarmed and carried ten persons. It left Weisbaden at 10.31 a.m., Greenwich time, for a flight over the Baltic Sea, and 2½ hours later reported by radio crossing the coastline of the British zone of Germany. The investigation conducted by the U.S. government had convinced it that the U.S.N. aircraft in question complied strictly with instructions, and did not fly over any Soviet or Soviet-occupied territory or territorial waters adjacent thereto. After a full statement of the pertinent facts the American Note continued: "It must be concluded that Soviet military aircraft fired upon an unarmed American plane over the open sea, following which the American aeroplane was lost. The Ambassador of the United States has been instructed to protest in the most solemn manner against this violation of international law and of the most elementary rules of peaceful conduct between nations." An enquiry, punitive action and indemnity for American lives and property is demanded.

In a statement accompanying release of the Note, Mr. McDermott, of the American State Department, said that the protest corrected the distortions of fact which the Soviet government had injected into the incident, and put the manner in its true light as an attack against unarmed Americans. It was charged that the American aircraft fired first, he said, when, in fact, the Privateer had nothing with which to shoot and was too slow an aircraft to attack fighters.

On April 21st Mr. Acheson announced in Washington that Moscow had replied to the American Note; he added that the reply did not appear to contain any new information which would cause the United States Government to change its attitude as set forth in the Note of April 18th.

Much of the text of the Soviet reply was, in fact, a repetition of the original Moscow announcement, though this time insistence was placed on the statement that the aircraft was a B-29—"... it has been established with certainty that the aircraft which flew over Soviet territory south of Libava was a B-29 Flying Fortress, bearing American identification marks."

After maintaining that all air forces are under orders to protect the inviolability of their frontiers, and would have acted precisely as did the Soviet Air Force, the Note went on to say that, if the American aircraft was actually lost, "the responsibility for its loss rests exclusively with those gentlemen who forced the American aircraft to fly over Soviet territory for the purpose of photographing Soviet defences, and thereby made it violate international law and the inviolability of Soviet frontiers."

AN R.O.C. REUNION

OF the many gatherings last week in celebration of the silver jubilee of the Royal Observer Corps, the reunion of past and present members of London posts north of the Thames was probably typical in spirit though unquestionably unique in surroundings, for it was held in the restaurant at London Airport, with corpulent Stratocruisers taxying past the big windows and a pleasant female voice ("May I have your attention, please? Air France flight 118A from Paris has now landed") occasionally interrupting the speakers.

Present were over 200 representatives—the serving members in uniform—from posts in the 17 Group area, which covers an irregular rectangle of some 500 square miles, with Watford as its operational H.Q.

Since one of the chief purposes of a reunion is to encourage, over a can of beer, the re-living of good old days, it was, perhaps, a pity that the official oratory was over-long, so that little time was left for private reminiscing; but the speeches undoubtedly served to remind the newer R.O.C. members how deeply and strongly the roots of tradition and keenness have grown in 25 years.

The toast of "The Royal Observer Corps" was proposed by Mr. George R. Bolton, M.B.E., who was controller of the ops. room at Watford until 1943; he referred to a much earlier R.O.C.—the beacon-light volunteers of Spanish Armada days—"but they got quite well paid for it" (laughter).

Replying, Obs. Cdr. B. Parkes, M.V.O., commanding No. 17 Group (and formerly R.O.C. liaison officer with 11 Group, Fighter Command) recalled how, in 1930, a small, highly trained nucleus had trained the big war-time intake, and said that if this post-war period should unfortunately prove to be a pre-war period the newer generation of observers were ready to do the same again. Quality, not quantity, was still the aim.

G/C. L. T. Courtney, C.B.E., proposed the health of A. Cdre. A. D. Warrington-Morris, C.B., C.M.G., O.B.E., who was Commandant of the Observer Corps up to 1943 and who had the tremendous task of expanding it to a strength of 34,000; on August 24th, 1939, when the Corps was called out, it was the only civilian defence organization fully ready to function.

A. Cdre. Warrington-Morris, in his reply, gave some interesting war-time reminiscences that included the story of Rudolf Hess's arrival in this country by Me 110, in the reporting of which—sceptically received by other Services—the Observer Corps played a big part.

Obs. Lt. G. A. D. Bourne, Group Officer, who had organized the reunion, proposed the toast of "The Visitors," and the evening concluded with the announcement, by Obs. Lt. D. Miller, of results of the recently held Master-observer Tests, in which 27 Group was placed seventh among the 39 Groups comprising the total strength of the R.O.C.

NEW R.Ae.S. PRESIDENT

THE Royal Aeronautical Society announces the election of Maj. G. P. Bulman, C.B.E., O.B.E., F.R.Ae.S., as president for 1950-51. He takes office next month in succession to Sir John S. Buchanan, C.B.E., A.M.I.Mech.E., F.R.Ae.S.

Maj. Bulman, who was commissioned in the R.F.C. in May, 1915, was posted to the A.I.D., in which he held a number of increasingly responsible positions, eventually being appointed, in 1919, Chief Inspector of Engines. In 1928 he became Assistant Director, Research and Development (Engines), and ten years later was appointed Director of Engine Production. After the outbreak of the Second World War he continued to serve in the technical field, with emphasis on aircraft engines, his successive posts being Deputy Director-General of Engine Production and Development, M.A.P., and Director of Engine Development. In January, 1944, he was appointed to the new M.A.P. post of Director of Construction of Research Facilities, and has since been responsible for progressing works services and provision of plant at all M.o.S. research and development establishments.

Major G. P. Bulman.

Maj. Bulman was awarded the O.B.E. (Mil.) in 1918 and the C.B.E. (Civil) in 1941. He joined the R.Ae.S. as an Associate Fellow in 1917 and was elected a Fellow in 1932. He was a Member of the Council for 1930-34, 1935-39 and 1945-50. He is chairman of the lectures committee.

HIGH-SPEED RESEARCH

IN a paper, *Recent Developments in High-Speed Research*, by J. A. Beavan and D. W. Holder, to be read to the R.Ae.S. (at Manchester University) this evening, a survey is given of the work done in the Aerodynamics Division of the National Physical Laboratory, together with notes on some of the more important equipment used and the methods of operation. Also included is a review of some recent experiments, many of which are of what may be termed "fundamental" long-term type.

BALLIOL

Designed for training in all parts of the world.

The Balliol T.2 has been selected as the new standard advanced trainer for the Royal Air Force following competitive Service trials extending over twelve months. In the course of these trials, the Balliol has been thoroughly tested under tropical conditions and has proved itself as suitable for operation in the tropics as in more temperate climates.

With its service ceiling of 32,500 feet, the Balliol T.2 maintains a rate of climb of over 2,000 feet per minute to a height of 11,500 feet above sea level, and can thus be operated without difficulty from high altitude aerodromes. At 8,000 feet, its take-off distance to clear a 50-ft. screen does not exceed 640 yards.

BOULTON PAUL AIRCRAFT LTD.

WOLVERHAMPTON

One of the Doves in the service of Williamson Diamonds, Limited lands at the Company's mine in Tanganyika with two hundredweight of tractor spares, two milk churns, six cases of brandy, 150 lb. of floor polish, a case of car spares, a tool chest, a petrol engine, a windscreen, 70 lb. of stationery, 30 lb. of fresh meat, two suitcases, three hundredweight of steel tyres and ten live ducks

DE HAVILLAND DOVE

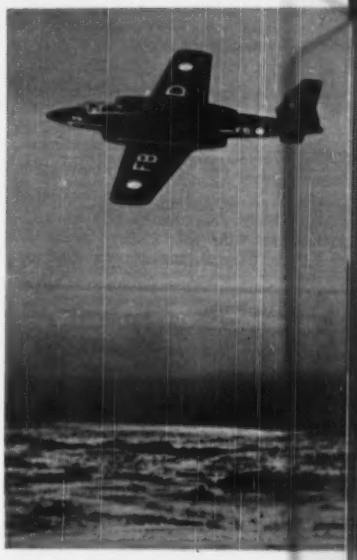
Pictured with S/L. Waterton (centre) after the demonstration are (left to right) Mr. E. H. Atkin, Avro Canada chief engineer; Viscount Alexander, Governor-General of Canada; the Hon. Brooke Claxton, Defence Minister; Prince Bernhard; Dr. van Roijen, Netherlands Ambassador; and A.V-M. A. L. James, acting Chief of Air Staff, R.C.A.F. Views below show the CF-100 during its display.

ALL-WEATHER FIGHTER

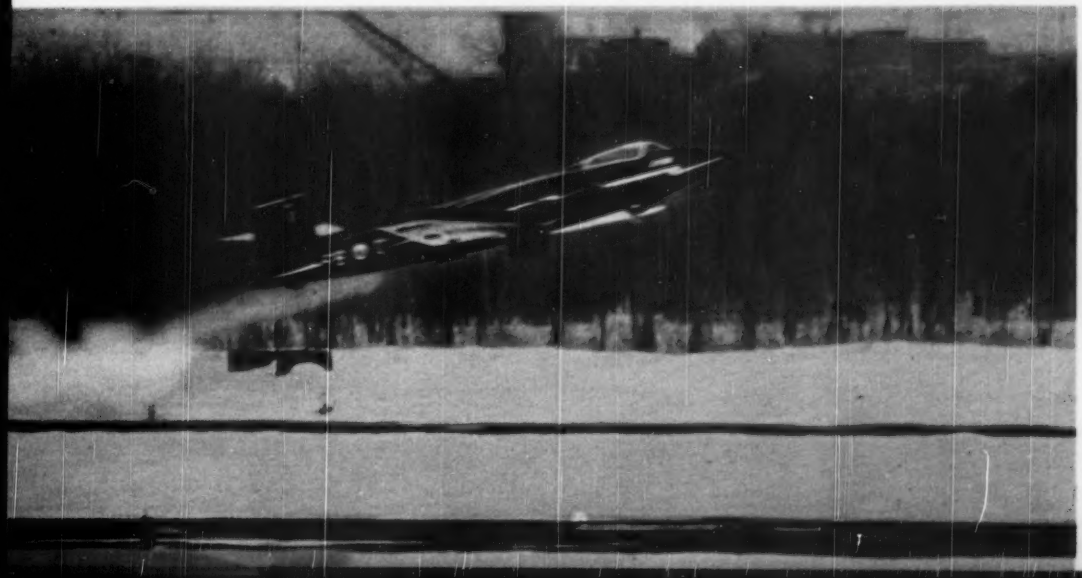
THE snow-clad environs of Rockcliffe R.C.A.F. Station proved an apt background for the first full-dress demonstration, last month, of the new Canadian all-weather fighter, Avro Canada's CF-100. The pilot was S/L. Bill Waterton (himself a Canadian, although chief test pilot to the British Gloster Company), who flew the CF-100 for the first time on January 19th. Although the display took place while the test programme was in a relatively early stage, the new fighter was seen by a distinguished audience to possess lively performance and good control qualities at both ends of the speed scale. Among those present was H.R.H. Prince Bernhard of the Netherlands, who flew with Waterton in a Meteor 7 some two years ago, during a visit to Glosters.

Already, the CF-100 offers a promise of success as definite as that shown by its civil relation, the Jetliner, Avro Canada's first prototype. Designed for night and all-weather interception or long-range attack, and carrying a crew of pilot and radio-navigator, the CF-100 eliminates a former American monopoly of experience with this new and necessary form of fighter.

Its source of power consists, at present, of two Rolls-Royce Avon axial-flow turbojets. Now under intensive development, however, is the Avro Canada Orenda, a unit of comparable output, which is intended to power production CF-100s.



A lively impression—with an appropriate setting—of Canada's jet fighter taking off at Rockcliffe.



A Special Series of Photographs

by John Warham

ORNISCOPICS

Photographic Interpretations of Bird-flight :

THESE photographs are of outstanding interest in that the various attitudes in which the birds have been "frozen" makes possible a leisured study of the configuration at a particular instant in the given flight manœuvre. The Little Owl (1), for example, has launched itself into the air—giving a final kick-off with its left leg—whilst simultaneously opening its wings for the first downbeat. The primary feathers are well separated and each acts as an individual aerofoil, whereas the secondaries are closed up and preserve the aerofoil section of the wing to its full chord.

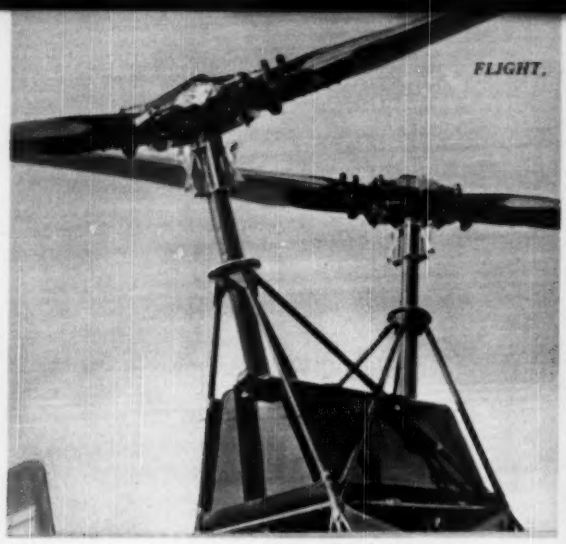
An entirely different form of take-off is shown in (2), the Swallow having been caught diving from its nest under the eaves of a roof. Here the wings are almost fully extended at the top of their stroke, with the primaries and secondaries virtually closed up. In this condition, the wings are not producing lift, but, equally, they are not causing drag, which would unduly hamper get-away; at the same time they are in such a position that they are at immediate readiness to make the first lift-producing downbeat when required. Another shot taken at the top of the wing stroke is shown at (3), again of a Little Owl. Apart from showing the spreading of the first four primaries, this photograph also illustrates with remarkable clarity the multitude of small, downy feathers which make up the under-surface of the wing between the shoulder and butt—i.e., about semi-span—for the leading 50 per cent chord.

The Barn Owl in (4) is actually flying upward and, as may be seen, has no freedom to fly forward, whilst the stroke of its starboard wing is restricted by the wall. It is, perhaps, for the latter reason that its tail feathers are fanned asymmetrically. The extension of the alula (the small surface at the butt of the wing, suggestive of a Handley Page slat) is also noteworthy. By contrast, the Barn Owl shown making its final

Nature's Use of Variable-area, Variable-incidence Surfaces : Slot Effects : Air Braking

approach in (5) can be seen to be exercising the maximum amount of parachute drag. High drag is also exercised by the Little Owl shown in (6) at the instant before touch-down, although in this case the separation of the primaries is not so marked as in (5), and it is likely that some degree of lift was being obtained. The Blue Titmouse in (7) has its wings completely folded, however, and provides a source of some speculation as to whether birds do, in fact, make "pilot errors." Is it possible that the Titmouse has undershot, and to rectify the matter has closed its wings so that drag is reduced and momentum used to extend the glide-path?

Charles Kaman flexing a blade in order to inspect his unique servo-operated device for effecting rotor blade pitch-change.



Detail of the twin rotor heads, showing blade swinging- and drag-hinges, servo control-wires and toggle-action droop-stops.

KAMAN DEVELOPMENTS

Larger Three-seat Model in Production and Leasehold Scheme for Operators Inaugurated

SINCE the time when, in January, 1947, a group of Boston businessmen travelled to Bradley Field, Connecticut, to witness the first flights of the Kaman K-125 prototype helicopter, the fortunes of Charles H. Kaman, the inventor of these singular aircraft, have prospered in no small measure.

The K-125 first prototype was powered with a 125 h.p. engine which, it was found, did not give an output great enough to meet the demands made upon it and, as a result, the second Kaman design employed a 190 h.p. Lycoming 0-435 engine and was given the type designation of K-190. Several machines of this type were built, and the design was described in some detail in the August 26th, 1948, issue of *Flight*.

The essence of the Kaman design is that the twin intermeshing rotors, each two blades of which "see-saw" about a single central hinge, have their pitch altered cyclically by the singular expedient of twisting the blades, this being effected by means of small, trailing servo-surfaces mounted on the blades at approximately 0.75 radius. The advantages of this method of blade pitch-change actuation are that the necessity for blade-root bearings and flapping hinges is eliminated, and that the control stick forces are extremely light.

The original K-125 prototype Kaman helicopter (left) is here seen flying in company with two of the later, higher-powered K-190s.

The absence of a tail rotor for torque compensation permits the Kaman helicopter to execute quite startling low-level "flares."

This demonstration of crop-dusting with a K-190 (note the hoppers on each side) shows the effective dispersion characteristics.

Production work has now started on a larger, three-seater helicopter—the K-225—which, powered with a Lycoming 0-435 engine delivering 225 h.p., has a disposable load of 900 lb for a rated gross weight of 2,700 lb. The cruising speed is said to be 65 m.p.h. and the maximum speed 73 m.p.h. This aircraft was accepted by the U.S. Navy on the basis of inspections and tests carried out by the Civil Aeronautics Administration. The K-225 has also been accepted by the U.S. Coastguard.

Although he has achieved some measure of success in obtaining Service contracts for his helicopters, Charles Kaman has not disregarded the civil field. Investigation has shown that the majority of commercial helicopter operators rely for their main revenue on the provision of specialized services to agriculture. However, although this pays well, the season is relatively short and many operators have found difficulty in finding employment for their helicopters in out-of-season periods.

This seasonal variation was thought by Kaman to restrict potential sales of his helicopters, and so he decided on the rather bold step of inaugurating the leasing of "helicopter packages," comprising a K-225 complete with all relevant accessories, Kaman-trained personnel, full insurance and a guaranteed maintenance contract.

From the operator's point of view, by leasing a "package," he would be able to evaluate his market without undue financial risk and decide either to purchase the equipment or return it to the manufacturers until such time as another season with high utilization prospects occurred. Equipment returned to the works might then be leased out to other operators for non-seasonal duties, or might be transported across the country for agricultural work in different terrain. In evolving and putting into execution such a plan, Charles Kaman is to be congratulated on his commercial courage, for the practical success of the scheme would appear to depend to a great extent on factors over which it might be exceedingly difficult to keep control. Competitors are watching the experiment with interest.

The XHK-225 for the United States Navy is equipped with radio, dual controls and parking brakes, but the rudder is "fixed."

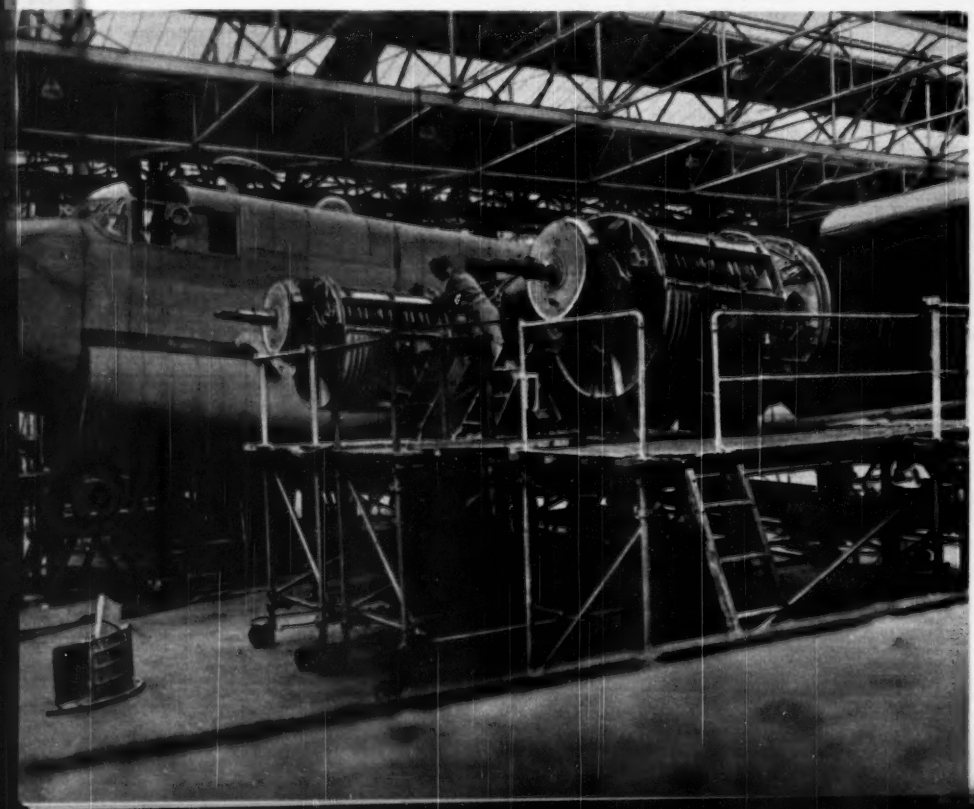
AT AVRO'S NOW

Shackleton General Reconnaissance Aircraft for Coastal Command and Athena Advanced Trainers on the Line at Manchester : Three Shackleton Prototypes

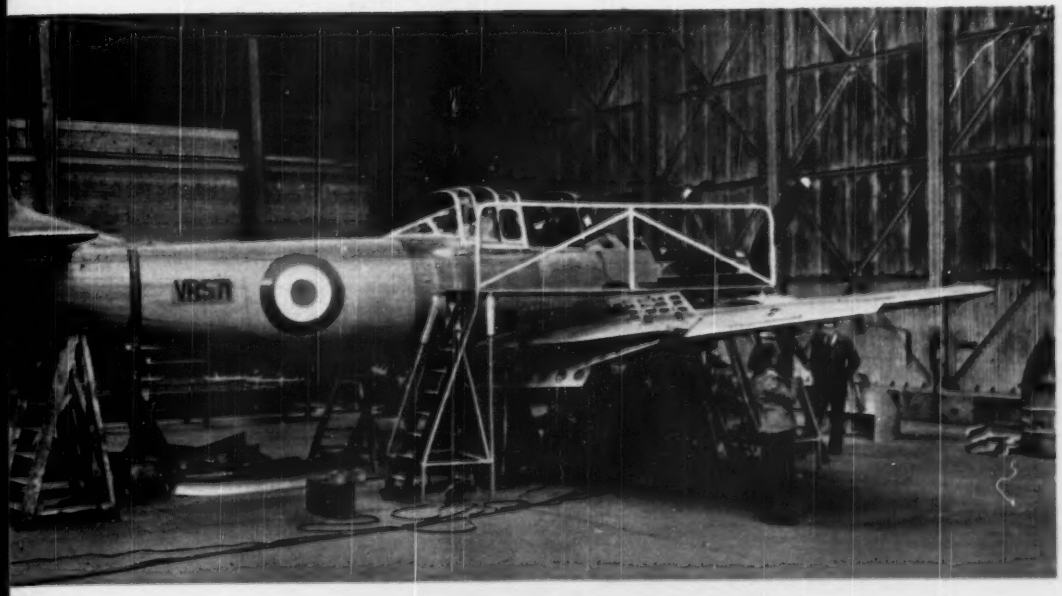
THREE prototypes of the Avro Shackleton G.R.1 general reconnaissance aircraft, now in quantity production for R.A.F. Coastal Command, are on test, and the production line in the Manchester works is shaping well. Though all three examples—VW 126, VW 131 and VW 135—are generally similar, the third machine displays slight external alterations, and differs further in crew arrangements. On all three machines the twin 20 mm barbette-mounted nose guns, originally installed on VW 126, are now absent; the tail turret, with twin 0.5in guns, has likewise been eliminated, and another feature now dispensed with is the flight-refuelling point under the tail.

Although many components of the Shackleton are basically similar to those of the Lincoln, the fuselage is altogether broader and deeper, and the level of comfort afforded has seldom, if ever, been attained in a Service landplane. Even in the tail a man of average height may stand erect, and passage through the length of the fuselage is readily accomplished, notwithstanding the centre-section spars. The galley, rest bunks, soundproofing and liberal fenestration all contribute to the reduction of fatigue which, on a long over-water sortie, is so desirable in sustaining crew efficiency.

At upper right, all three Shackleton prototypes are seen together. Below, on this page, work is in progress on one of the Rolls-Royce Griffons of a production Shackleton, and at lower right an Athena 2 (Merlin) is seen to be well advanced. In the small heading illustration, Mr. J. H. Orrell (right), chief test pilot, is seen running over the Shackleton test schedule with Mr. J. D. Baker, one of his team at the Woodford airfield.



(illustrated with "Flight" photographs)



SYDNEY'S INTERNATIONAL AIRPORT

The Kingsford-Smith Extensions at Mascot : Progress of a Major Engineering Project

By H. BOWDEN FLETCHER, D.F.C.

Some idea of the immense amount of civil engineering work that may be involved in a major airport-extension scheme is obtainable from this description of the proposed layout and equipment for the new Kingsford-Smith Airport at Sydney, N.S.W. In this instance the problem is complicated by the necessity for diverting a river. The buildings are not likely to be started before 1953, and no plans are yet available because new developments in the meantime might render them obsolete. Progress of the general work is at present being delayed, it is reported, by constructional difficulties with the foundations of the viaduct which is being built to carry a diverted sewer.

THE area of land involved in the existing Kingsford-Smith Airport at Mascot, Sydney, N.S.W., comprises 450 acres, and future extensions, to bring it to international standard, appeared to be barred by the Cooks River, which meanders, shaped like a dog's hind leg, round the southern boundary. The first work in connection with the plan to make Mascot the major international airport for Australia therefore entailed the construction of a new course for the river.

Until this task is complete, the 1,000 extra acres of land acquired cannot be put to use at all. The new course of the river will be 1¼ miles long and 500ft wide, and will involve the excavation of 2,500,000 cu yd of sand, all of which is being used to fill in the old river bed on the northern bank.

Briefly, the plan involves—in Stage 1, now being implemented—the construction of two runways, namely, No. 6/24, 200ft wide and 8,000ft long, and No. 16/34, of the same width and 5,500ft long. The location of 6/24 is right down the centre of the existing river-bed. Also involved will be the construction of taxiways to link all runways with the aircraft aprons, which will be extensive enough to provide adequate loading frontage for passenger- and freight-handling. The total area of pavement involved will be 300,000 sq yd of runways, 250,000 sq yd of taxiways and 330,000 sq yd of aprons. Runway materials have not yet been definitely decided upon, but it is thought that bitumen-sealed gravel will be used, with concrete hard-standings for jet aircraft.

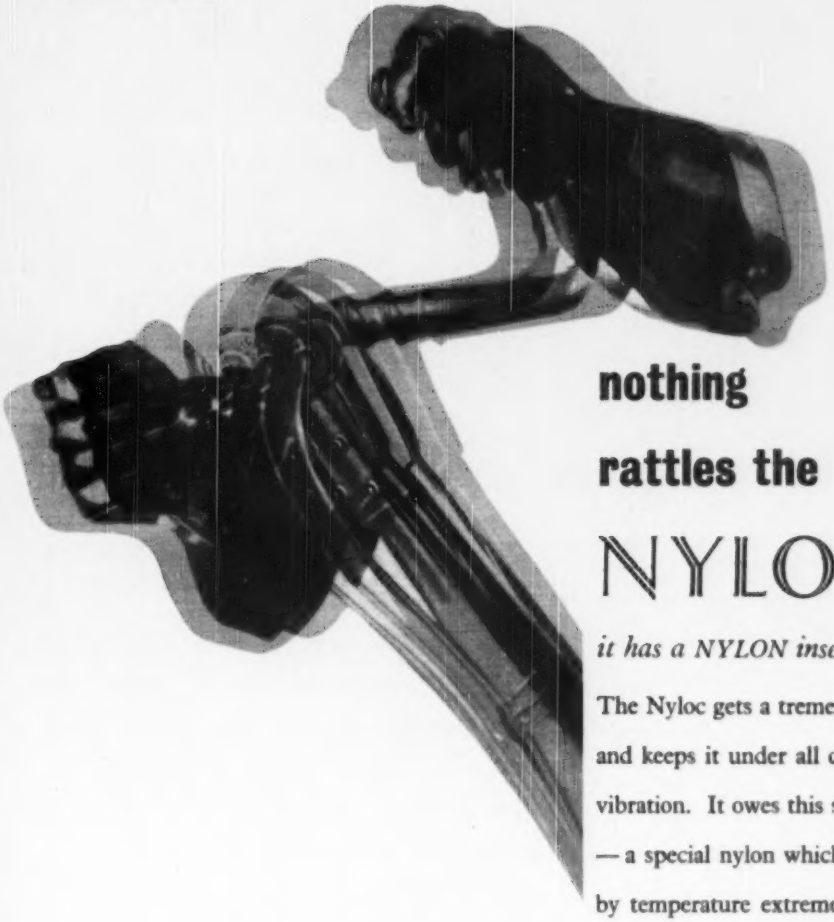
The hangar block will comprise approximately 100 acres and will provide a total of 1¼ million sq ft of hangar and workshop space. The terminal block will take 70 acres, with provision for doubling as required, and will cater for airport administration and control, passenger handling, facilities for cafés and shops, and a sightseers' promenade. The overseas terminal will have provision for Health, Customs and Immigration, mails, bond stores and banks, together with visitors' lounges. Car parks are also included.

The length of loading frontage available in this first stage will be approximately 3,500ft, but the figure can be increased to 7,500ft when required. Provision is also made for the time when rail access will be required, but for the start transport will be by motor bus.

The Stage 1 plan covers the provision of an airport which would receive a grading, under the standards laid down by I.C.A.O., of B1, the two principal requirements of which are: (a) basic runway of not less than 7,000ft; (b) bearing capacity, single isolated wheel-load 100,000 lb at a tyre pressure of 120 lb/sq in. In view of the rapidly changing standards, it is not possible at present to see beyond this stage. However, provision is made for the extension of the base runway to 8,400ft to comply with the present standards for a classification of an A.1 airport.

Associated with the actual airport construction two other important works are necessary, and these are: (a) Construction of a new traffic bridge over the new course of Cooks River, 568ft long and 78ft wide in reinforced concrete; (b) The diversion of the main outfall sewers over the new river-crossing, with the construction of a viaduct 560ft long having a high-water clearance of 9ft 2in, also of reinforced concrete.

One of the problems associated with the excavation of



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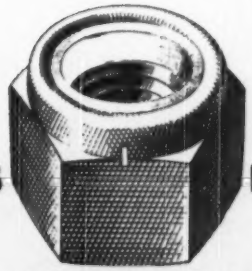

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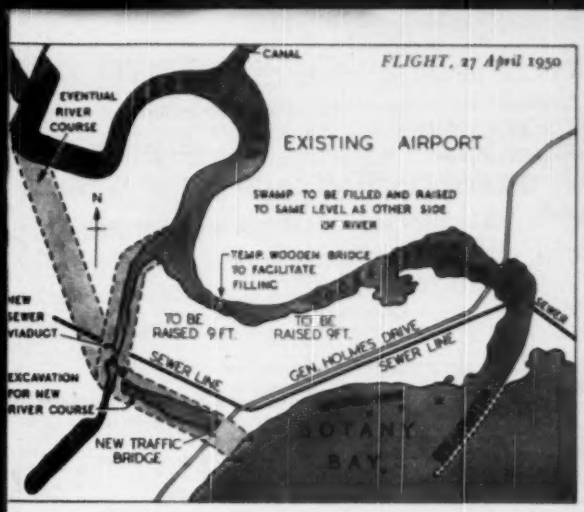


In the heading picture opposite is a general view of the excavations for the Cooks River diversion, looking towards General Holmes Drive. The vertical air photograph on the right shows the whole site and its environs; comparison with the key drawing above gives some idea of the magnitude of the project.

SYDNEY'S INTERNATIONAL AIRPORT . . .

the new river course is the presence of ground water, over the whole area, at depths ranging from one to three feet; it restricts the method of work to the use of drag-line excavators entirely. To keep the water down sufficiently to permit of the greatest efficiency by the operating equipment, a number of 6in electric pumps have been installed to pump out a minimum of 500,000 gall a day, but as the work progresses and the length of the excavation increases, two million gallons will need to be extracted each day.

Before the ground water is reached, power shovels and bucket loaders are used, assisted by bulldozers to push the sand into heaps. As the whole area is of an extremely sandy nature, temporary roads have had to be laid to prevent the motor trucks from getting bogged. For this purpose boiler ash from the Bunnerong power station has been used; laid wet, well rolled and regularly watered, it has proved to be both economical and efficient in carrying the constant shuttle of moving trucks from the cut to the filling areas.

To provide for drainage of the extended area, protection against flooding, and make provision for the public services, it has been necessary to raise the level of the ground about nine feet by the provision of 11,000,000 cu yd of filling, including that taken from the new river cut. This is being obtained from the bed of Botany Bay, which adjoins the airport, and will be used, should it ever be decided to include a marine-aircraft base, for that purpose.

To secure the fill from Botany Bay three dredges have been designed and built with a combined capacity of 9,000 cu yd per day. The dredges will pump the sand through 16in pipelines direct to the filling areas as long as this is feasible; when it is not, stockpiles will be made from which the material will be transported by motor trucks to the required area.

In view of the facts that the main runway will be located down the centre of the existing river bed and that the whole surface is being raised by nine feet, the compaction and consolidation of the fill is of major importance and very close attention has been paid to this point.

At the filling points the motor trucks dump their load at the end of the ash road and it is then pushed out by Caterpillar D.8 tractors fitted with Le Tourneau 12ft blades. The constant movement of these heavy tractors is the basis of the consolidation but, when the time comes for the final filling-in of the existing river bed, the Porter pneumatic 200-ton compactor will be used. This machine, imported from U.S.A., can be used in four different weights from 50 to 200 tons, and is similar to the type successfully used on the international airport at New York.

Until the results of the consolidation have been thoroughly tested and assessed, the composition of the main runway will not be decided. The choice, of course, is between reinforced concrete or bitumen-sealed gravel.

As the traffic density of the airport at the present time averages 124 movements a day, with a maximum of 250 on such occasions as Easter and Christmas, it is considered the present two-runway plan will provide for the requirements of Sydney for at least 10 years, as it is capable of dealing with 400 movements a day, with a maximum of 40 per hour at peak periods. Some 2,200 passengers are at present handled each day and 4,000 motor vehicles enter the airport.

The plan is essentially a flexible one and included is provision for a third runway, No. 3/21, of 200ft width and 6,300ft length, should it be considered necessary, whilst the other two can be duplicated as and when required.

When duplication does take place runways will be at least 3,000ft apart and will be located in the centre of grass landing strips 1,000ft wide. The duplicate runways will be parallel to existing ones but on the other side of the control tower, in accordance with accepted airport management principles. Runways will possess a maximum longitudinal grade of 1 per cent and transverse 1.5 per cent.

It has definitely been decided that the aprons will be of reinforced concrete laid on a thoroughly consolidated sandstone base up to 14in in thickness and designed to carry a wheel loading of 100,000 lb and a tyre pressure of 100 lb/sq in.

Normal runway (as well as normal taxiway) lighting will be installed and high-intensity runway and high-intensity approach lighting will be included in the instrument runway. Obstruction lights are being provided where necessary, including hazard beacons on such places as the Sydney Harbour Bridge. An Airport rotating beacon is already installed.

Navigational aids cover a wide range, as the following list indicates:—

(1) V.A.R. radio range (112-118 mc/s), four course, which will later be converted to V.O.R. omni-range.
(2) M.F. homing beacon.
(3) 200 mc/s D.M.E. (distance-measuring equipment).
(4) 1,000 mc/s D.M.E. for international aircraft.
(5) Instrument landing system on one and possibly two runway approaches, comprising: localizer, 108-112 mc/s; glide-path transmitter, 330 mc/s marker beacons, 75 mc/s M.F. locator (homing) beacons;

SYDNEY'S INTERNATIONAL AIRPORT . . .

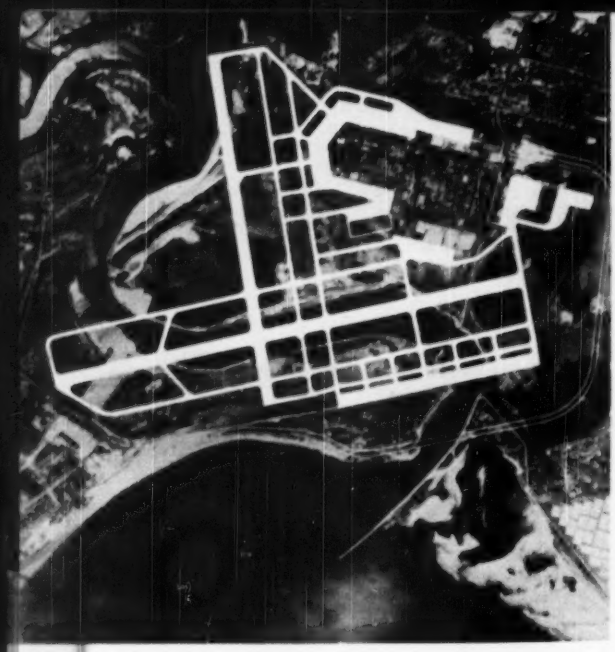
D.M.E., both 200 mc/s and 1,000 mc/s; approach lighting system.

(6) Short-range approach radar (30 miles).
(7) Precision approach beam radar.
(8) Long-range approach control (150 miles).

Items 2, 6 and 8 are already installed, 1 and 3 are in process of installation and tenders have been invited for No. 5.

Communication facilities for the efficient control of airport, aircraft and meteorological services are to be as comprehensive as possible, and include V.H.F., for which tenders have just been accepted for the provision of 140 air-ground-air stations throughout Australia. Radio teletype circuits are to be available in Honolulu, Fiji, New Zealand and Darwin, whilst extensive landline telephone and teletype communications are being constructed to link Mascot with Melbourne, Brisbane, Canberra, Wagga and other important airports. Direct communication between Mascot air traffic controller and aircraft over the last 60 miles is being operated from the flight progress board recently installed.

Nothing is being left to chance and every conceivable aid to aircraft control and navigation is being provided so that Kingsford-Smith will lack nothing required to make it, in truth, the complete international airport for Australia.



Layout of the proposed two-runway scheme superimposed on a "vertical" of the existing airport with its four-runway system.

BORN NAVIGATORS

The Pigeons' Secret Scientifically Investigated

THE as yet unsolved problem of how homing pigeons navigate, which has exercised the mind of man for many hundreds of years, is revived in a recent number of the *Sperry Review*, where a *résumé* is given of a paper describing some interesting experiments made by Prof. Yeagley of Pennsylvania State College.

Arguing that the sensing of two separate influences is necessary for accurate navigation, the professor tested his own theory that one of these influences was the earth's magnetism and the other the Coriolis force. It is this force that acts on moving bodies as a result of the rotation of the earth about its axis.

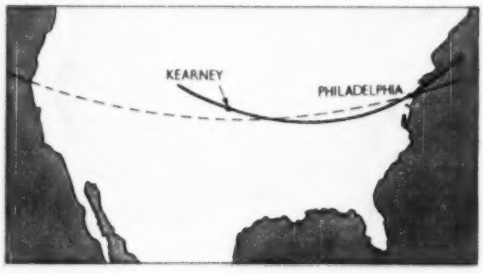
To test the effect of magnetism he had twenty young pigeons trained by an expert to find their way home from distances up to 100 miles. In order that the homing should be by true navigation and not by memory, all the training flights were made over country to the north of the home loft, but for the experimental flight the birds were released from a spot 70 miles south. No bird was flown until the one previously released was out of sight. Before each pigeon left, small metal plates were fixed under its wings, one pair to each bird. These plates were all of the same size and weight, but on the odd-numbered birds they were made of plain copper, while those on the even numbers were Hyflux-chrome magnets.

In the 48 hours following the release, nine birds got back. Eight of these carried copper plates; the other had one magnet left. Four days later the only pigeon to home with two magnets arrived and the same day four more arrived, two with no magnets and two with one each.

Having decided to his own satisfaction that the earth's magnetism was, in fact, one of the forces, Prof. Yeagley then devised another test combining the effect of magnetism and the Coriolis force.

He obtained a map overprinted with a grid composed of (a) lines along which the vertical component of the earth's magnetic field is equal, and (b) lines along which the intensity of the Coriolis force is equal. The lines of equal Coriolis force are circles parallel to the lines of latitude, but the magnetic lines centre round the magnetic north and south poles. As the two centres are not common, the circles intersect and form a grid.

The magnetic lines, however, do not always run true to pattern, and Prof. Yeagley noticed that the two sets of lines ran roughly parallel across Indiana—an area where, it is known, pigeons are unable to home. The professor thought that their characteristic behaviour in this district might be explained by the theory that the pigeon did not feel "at home" at any one particular spot, and that it sensed the forces over a large area.



Intersection of 40 deg. latitude line (dotted) and line of equal magnetic force, the basis of Professor Yeagley's experiment.

Further study of the gridded map revealed places on each side of this Indiana "parallel" area where one line in the magnetic field doubled back and crossed the same line in the Coriolis force field. This meant that there were two places, 1,100 miles apart, where—if the theory was to prove accurate—the pigeons would feel equally "at home." One of these places was the Pennsylvania State College, Philadelphia. Its conjugate point occurred near Kearney, Nebraska.

The selected birds were trained in navigation at State College, and then taken to Kearney. After two days to settle down, they were released at points varying from 25 miles to 200 miles from the new location. Each bird carried a message capsule asking the finder to report the time and place of arrival.

The results of this second experiment were very confusing, but the professor considered that they bore out his theory. Out of 120 birds released on one test some were never recovered, some flew to the conjugate point in Nebraska and only one was known to have flown to the east of the "parallel" area in Indiana. The best performance of all was by a light blue check female pigeon which, from its release point, flew 185 miles in a direction opposite to its real home in State College to find its 4ft x 4ft x 5ft loft, displaced 1,100 miles to the west in a Nebraska cornfield.

J. Y.

The reasons behind the choice of a high-wing layout for the Ambassador were entirely practical.

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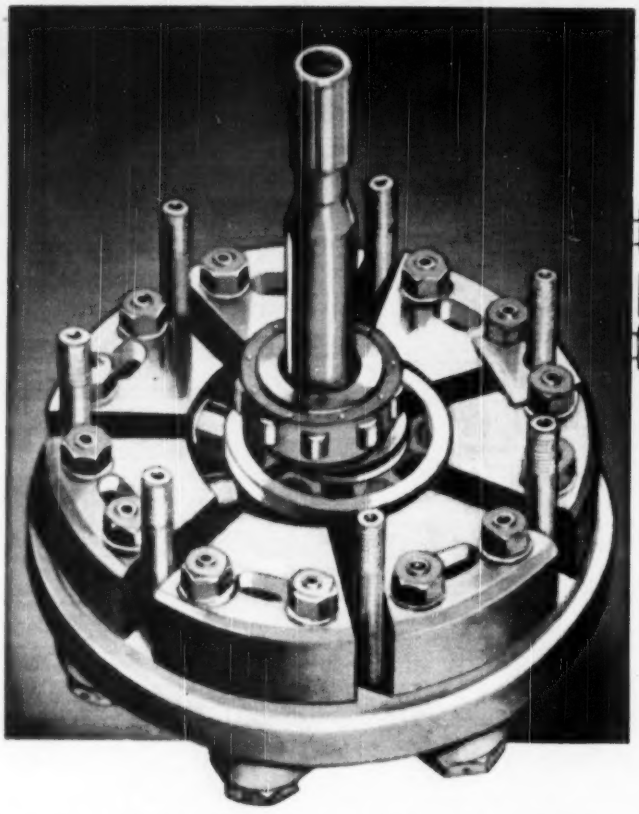

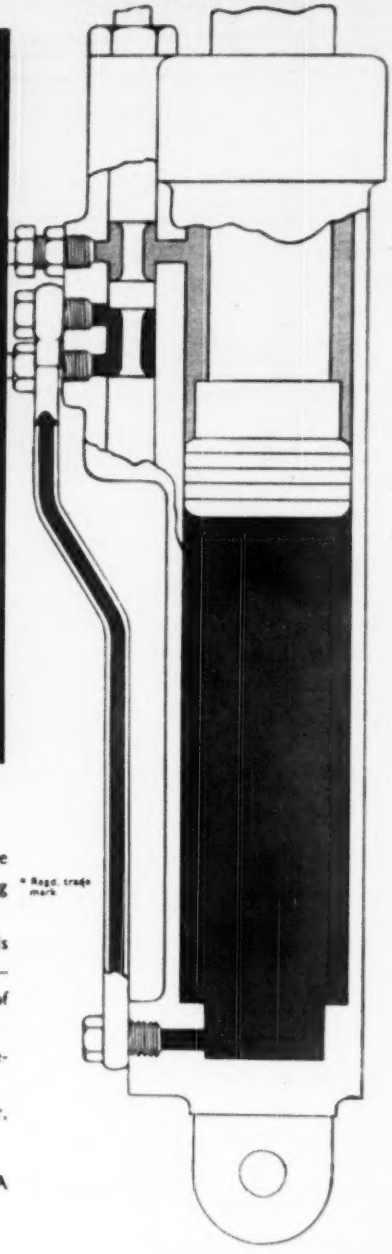

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CIVIL AVIATION NEWS

B.O.A.C. STAFF CHANGES

LAST week-end it was announced that Mr. J. W. Booth, joint deputy chairman of B.O.A.C., had resigned from that position, although he would remain a part-time member of the board. It is understood that the reason for the change is Mr. Booth's desire to devote more time to his family business, and that there was no difference of opinion with the Board or its policy.

When Sir Miles Thomas, the chairman, returned from his recent trip to America, he was reported as saying that he had made dollar savings by pruning the North American staff, and the impression was given that this was more or less the work of a week-end. The position is that the pruning referred to had been carefully worked out over a period of two years, and the mandate given to Sir Miles himself to reorganize B.O.A.C., both at home and abroad, is now almost complete. In this connection Sir Miles Thomas stated that he was satisfied that the organization had been pruned to a hard core of personnel who could look forward with confidence to their continued employment and promotion. The total number of employees has been reduced from 24,000 to 16,000.

As a result of Mr. John Booth's resignation, much of his work in connection with the commercial side of B.O.A.C. will be taken over by Sir Miles, while duties concerned with passenger handling will now devolve upon Mr. Whitney Straight, the remaining deputy chairman of B.O.A.C. No successor to Mr. Booth is expected.

One newspaper correspondent (who, it seems, has kept a tally) says that twelve executives or senior officials were moved around in the Corporations during the last year, 34 directors or officials have been changed since the war, and six different chairmen have served the two existing Boards.

A BITTER BLOW

THERE can be no other way to describe the effect on British civil aviation of the news contained in last week's Budget. The existing tax on aviation spirit had for some time been regarded as one of the most annoying and unnecessary hindrances to the development on a sound economic basis of air transport in this country; in fact, as mentioned in *Flight* last week, representations had recently been made to bring about at least some alleviation, if not complete removal, of this burdensome levy.

With the Corporations striving to reduce their annual deficits and the charter companies to function in spite of the already prohibitive operating costs, the virtual increase of 3*d* per aircraft mile in the cost of running a typical feeder-line aircraft (and nearly twice this amount in the case of a 24-seat short-range transport) is indeed an appalling prospect. A most distressing aspect of the problem is that both the Corporations and the charter companies must compete with foreign operators who are free from this burden; and, as fares are based on current operational and maintenance costs, the unfortunate implications are, of course, obvious.

Our feelings on the subject are voiced in a leading article in this issue, and we reproduce in full (below) the combined protest which has been made by most of the principal aviation organizations.

OPERATIONAL STANDARDS

SOME of the new operational standards and procedures which have been recommended by I.C.A.O. are included in recently issued amendments to the various navigation orders and regulations contained in the Civil Aviation Act, 1949. Public transport operators will now be required to provide means for training, practice by, and periodic testing of, crews flying on scheduled services; to provide operations manuals for crew guidance; and to establish meteorological minima for each airport likely to be used. Flying times of individuals must be recorded and certain limitations are imposed on the amount of flying which may be done in any given period. Restrictions on the carriage of dangerous goods by passenger-carrying aircraft are now extended to all types.

CRITICAL CARGO

THERE has recently been an increasing need for developing methods by which radio-active isotopes required for medical services and industrial research can be safely carried in aircraft. In order to minimize the harmful effects of these materials on human and animal tissues, consignments of isotopes sent by air are packed in specially designed containers which completely eliminate danger to human beings standing more than two or three feet away.

The present regulations governing the carriage of these materials state that radio-activity at the surface of the package may not exceed 100 millirôntgens per hour and the distance at which the consignments can be dangerous to bystanders must be shown on the accompanying label. The possibilities of damage in a forced landing raise other points. No danger to health will be caused by proximity to the container for an hour or two, and in the event of fire of such intensity that the package is destroyed, it can be safely assumed that the radio-active material will be volatilized and dispersed. To avoid the neces-

THE PETROL TAX: A CONCERTED PROTEST

A COMBINED protest against the doubling of the petrol tax was made last week after an emergency meeting had been called in London by eight leading aviation organizations—the Society of British Aircraft Constructors; the Air League of the British Empire; the Royal Aero Club; the Air Transport section of the London Chamber of Commerce; The Joint Air Transport Committee of the Federation of British Industries, the Association of British Chambers of Commerce and the London Chamber of Commerce; The Association of British Aero Clubs; the British Air Charter Association; and the Helicopter Association of Great Britain.

A telegram was also despatched to the Chancellor of the Exchequer urgently requesting a review of the whole question of the tax on petrol, including aviation spirit, as it affects the aviation industry.

After the meeting, the following statement, dated April 19th, was issued from the offices of the Air League:—

"The addition of 9*d* a gallon on petrol, including aviation spirit, announced in the Chancellor of the Exchequer's Budget speech, is a bitter blow to the entire aviation industry.

"The previous tax of 9*d* a gallon which is levied on aviation spirit used for all purposes, including the operation of internal air services, for test flying of aircraft, for training flights and for the bench testing of aero engines, was already a heavy burden on the industry and the airlines, from which they have already sought relief. So far as aircraft manufacturers are concerned it will be appreciated that in the course of test flying and the testing of aero engines incidental to the production and maintenance of aircraft and engines, very large quantities of aviation spirit are used, and the increase in the cost of aircraft and engines, apart from any other consideration, will constitute an additional handicap to British manufacturers in foreign markets.

"The additional tax will cost the airline Corporations over £300,000 in a year. It will be a crippling addition to the costs of the air-charter companies which, like the airlines, have to face very severe foreign competition. Their maintenance costs, in particular, will be heavily increased in relation to foreign competitors. The tax will still further discourage the development of air services in the United Kingdom.

"The flying clubs, of all users of aviation petrol, will probably be the hardest hit. Their struggle to continue their operations—which, since the end of the war, have been threatened with extinction—is too well known to need further stress. They and the Air League have received great encouragement by the recently announced scheme for flying scholarships, under which over 200 Air Training Corps cadets will be trained every year in the flying clubs to Private Pilot's Licence standard. This training will involve a total of 6,000 hours flying a year but out of the £10,000 granted by the Government for this purpose £3,000 will now be absorbed by petrol tax.

"The cost of club flying averages £3 an hour, and with this increase in tax it will mean that 10*s* of the hourly rate will go to the Revenue. This will further increase the cost of club flying which is already beyond the means of many of those who, in the national interest, should be attracted to aviation, and completely nullifies the efforts which the flying clubs have been making to reduce their costs."

CIVIL AVIATION NEWS . . .

sity for a heavy lead shield around the container, some aircraft are now carrying isotopes in special compartments in their wing-tips. South African Airways are using this method on flights from London to South Africa.

The aircraft can be refuelled without any radiation danger to groundcrews, and in the event of delay at a landing point no action is necessary unless work has to be carried out at a distance of less than 10ft from the container. If the aircraft makes a forced landing the container is normally removed by a member of the crew, and, unless it can be transferred to a relief aircraft to arrive within a few days of the normal E.T.A., the container must be removed from the wing-tip and buried two feet under the ground.

K.L.M. REPAIRS APPROVED

THE C.A.A. has announced its approval of K.L.M.'s repair and maintenance base at Schiphol. This means that aircraft and components belonging to American companies and registered in the United States, may be repaired and put back into service without prior inspection by a C.A.A. representative. The certificate relates primarily to aircraft types used by K.L.M., but also authorizes routine inspections to certain other aircraft, notably the Boeing Stratocruiser.

The C.A.A. representative at the American Embassy in London recently flew to Schiphol to hand the certificate to Mr. J. Luymes, K.L.M.'s vice-president (engineering and maintenance). The scope of the various ratings includes minor or major repairs and periodic inspections on all current Douglas, Lockheed and Consolidated Vultee (Convair 240) models in regular commercial use, together with their associated powerplants, instruments, radio equipment and accessories. Routine inspections are also permitted on Boeing 377s and Curtiss C-46s.

A BRABAZON FORECAST

AT a recent meeting of the Bristol Engineering Manufacturers' Society, Mr. Walter Gibb, who is now a qualified Brabazon captain, said that before the aircraft made its first transatlantic run it would carry out a trial flight of comparable distance around the British Isles. Due to the effectiveness of its reversible-pitch airscrews, it would be able to land on any of the larger bomber airfields in Britain.

Mr. Gibb spoke of the excellent stalling characteristics which had been apparent during recent test flights. We are inclined, however, to doubt whether he was correctly reported by a correspondent as having said: "Stalling tests by dropping the Brabazon 10,000ft out of the sky produced entirely satisfactory results."

CHRISTENING COMPETITION

TWO free return tickets to Paris by the first week-end service to be flown by an Ambassador (scheduled for next month) are being offered as a prize to the member of B.E.A.'s staff who submits the best list of names for the Corporation's new fleet. Names are required for seven classes of aircraft, and the chief executive, Mr. Peter Masefield, has suggested that an interlinked series of names might be an attraction. Some suggestions already received are that each class of the fleet should be given a prefix such as *Silver*, *Golden*, *Emerald* or *Sapphire*, so that an Ambassador might be named *Silver Arrow* or *Silver Cloud*, while a Viscount could be christened *Golden Arrow*, and so on.

It has also been proposed that the Marathons, which will operate chiefly in Scotland, should be given the names of Scottish clans, while the Welsh helicopters might be called after King Arthur's Knights and the elderly DC-3s could commemmorate the names of aviation pioneers such as Cody, Charles Rolls and T. O. M. Sopwith.

U.K. TRAFFIC IN FEBRUARY

TOTAL movements at British civil airfields in February amounted to some 25,000, more than 9,000 of which were transport flights. The number of passengers using these airfields was 95,000, of which 9,000 were in transit. London Airport and Northolt reported 24,000 and 34,000 respectively, which together represents 60 per cent of the total for the United Kingdom. Even though the month was shorter, the amount of freight handled showed an increase of almost 60 tons over January's figures, London handling almost 700 tons and Northolt some 450 tons.

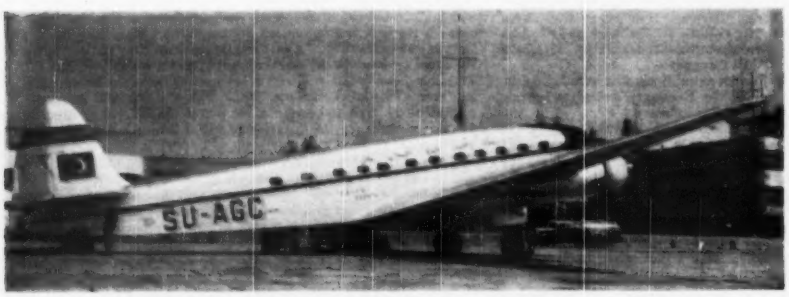
Renfrew was February's third busiest terminal, with 5,700 passengers and over 7,000 air-transport movements. Detailed figures are given in the table below.

Airfield	Aircraft Movements			Passengers (terminal and transit)	Freight (tons)
	Air Transport	Other Flights	Total		
Aberdeen (Dyce)	153	742	895	1,155	10.8
Belfast (Nutts Corner)	408	61	469	4,898	117.6
Birmingham (Elmdon)	154	573	727	905	14.3
Blackbushe	80	1,697	1,777	1,252	19.2
Blackpool (Squire Gate)	132	380	532	301	13.9
Bovingdon	43	773	816	457	54.0
Bristol (Whitchurch)	—	1,036	1,036	—	—
Cardiff (Pengam Moors)	28	547	575	62	.1
Croydon	174	422	596	123	53.6
Edinburgh (Turnhouse)	173	1,198	1,371	1,037	1.5
Gatwick	12	50	62	57	—
Glasgow (Renfrew)	716	450	1,166	5,611	28.2
Hurn	6	1,691	1,697	33	.1
Isle of Man (Ronaldsway)	378	89	467	2,057	25.0
Inverness (Dalcross)	145	74	219	552	1.7
Kirkwall	243	19	262	1,193	8.6
Leeds (Yeadon)	19	441	460	22	4.9
Liverpool (Speke)	371	482	853	3,004	59.7
London	1,471	396	1,867	23,531	696.3
Lympne	7	181	188	17	—
Manchester (Ringway)	551	850	1,401	3,266	162.7
Northolt	2,612	684	3,296	33,970	446.6
Nottingham (Tollerton)	—	460	460	—	—
Prestwick	390	196	586	5,673	27.8
Shoreham	—	204	204	—	—
Southampton (Eastleigh)	185	1,434	1,619	1,255	1.7
Southampton Water	50	61	111	1,120	26.8
Weston-super-Mare	9	200	209	1	—
Wick	279	43	322	600	.4
Other Aerodromes	637	200	837	2,832	20.6
All reporting Airfields — February 1950	9,446	15,634	25,080	94,986	1,797.6
All reporting Airfields — February 1949	8,614	14,855	23,469	76,177	1,315.3

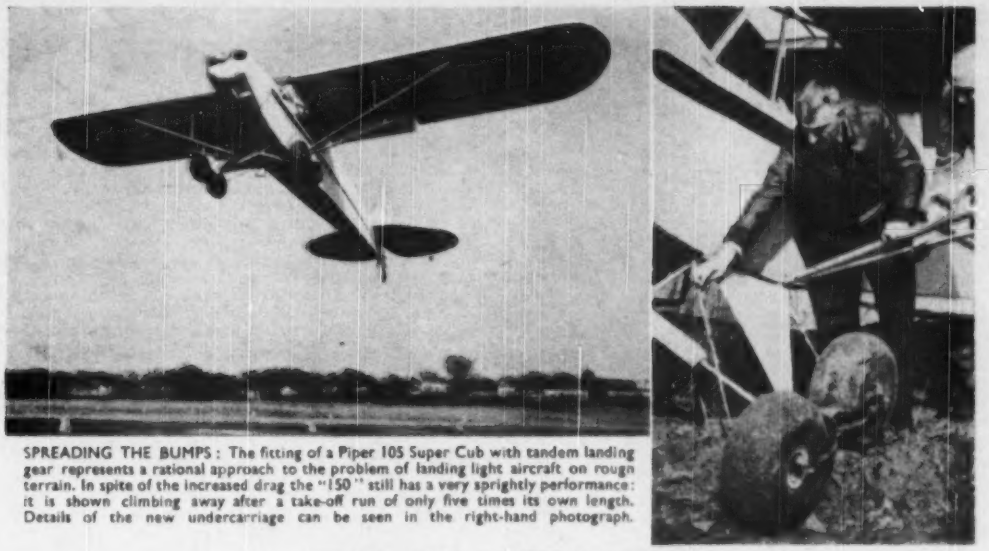
SPEEDY SPARES

TO ensure regular and speedy supply of spare parts for British cars purchased by Americans, B.O.A.C. has introduced a quick-delivery scheme for flying components to New York.

Announcing the new arrangements, the chairman of B.O.A.C., Sir Miles Thomas, stated that the Corporation was co-operating with the industry so that the owner of a British car in America could obtain a spare part the day after it had been ordered. Exporters would deliver the component to B.O.A.C. in the morning and it could reach New York the next day by one of the daily Stratocruiser services. Speedy inland distribution would be assured by an agreement with American operators. A special "commodity" rate has been instituted for this type of traffic, 8s 3d per kg being charged for a minimum of 227 kg.



"SAID!" S.A.I.D.E.: Weekly services are being flown between Cairo and Milan by a new Egyptian airline, S.A.I.D.E., which commenced operations on April 6th. The company is using SM.95s, one of which is shown at Forlanni Airport.



SPREADING THE BUMPS: The fitting of a Piper 105 Super Cub with tandem landing gear represents a rational approach to the problem of landing light aircraft on rough terrain. In spite of the increased drag the "150" still has a very sprightly performance: it is shown climbing away after a take-off run of only five times its own length. Details of the new undercarriage can be seen in the right-hand photograph.

BREVITIES

MEMBERS of the Aerolineas Argentinas technical staff are being sent to Schiphol for training in overhaul maintenance and repair techniques under K.L.M. instructors.

* * *

The chairman of B.E.A., Lord Douglas of Kirtleside, recently inspected the Corporation's new maintenance base at Renfrew. The buildings will be completed next month, and the base will then undertake the overhaul and servicing of all Rapides and DC-3s used on the Scottish services.

* * *

The Temco Manufacturing Co. recently announced that the Air Material Command of the U.S.A.F. has placed an order for the conversion of three C-97 Stratofreighters for use as general passenger transports. The company hopes to complete modification of the first aircraft by June; the others will follow at short intervals.

* * *

P.A.A. will use Stratocruisers on a regular trans-Pacific service from Sydney to San Francisco with effect from June 1st. The aircraft will fly from Honolulu to Sydney with slightly reduced loads because the runways at Mascot Airport are, at the moment, inadequate for fully loaded operations. A substantial reduction in scheduled flying time is expected.

* * *

The Government of Mexico recently ratified the I.C.A.O. Convention on International Rights of Aircraft, which is effective on July 4th. Following the United States, Mexico is the second nation to ratify this Convention; 23 other nations have signed it. The Convention is designed to afford international operators the largest possible measure of assistance in arranging the financing of aircraft purchases.

* * *

On April 30th, Tasman Empire Airways will celebrate the 10th anniversary of their first passenger-carrying flight. In ten years the company has flown 6,000,000 miles on regular services over the Tasman Sea and has carried 100,000 passengers without accident, together with over 3,000,000 lb of mail and cargo. Up to nine return flights are operated weekly on this Australia-New Zealand service.

* * *

Previously restricted to use only in daylight V.F.R. conditions until the height of a building in the northern funnel had been reduced, runway No. 6 (QDM16/134) at London Airport is now available for operations in all weathers. Marked at its highest point by a red omni-directional light, the building remains an obstruction and pilots are warned to exercise care until it is reduced in height. Details of lighting facilities on No. 6 runway are contained in Notam No. 63/1950.

Recent additions to freight services (most of which are flown at night) to some 16 Continental cities, now gives B.E.A. the largest freight network in Europe. Daily services are flown to Bückeburg and Nice, and the frequency to Rome, Amsterdam, Copenhagen, Hamburg and Berlin is six flights weekly.

* * *

British Nederland Airservices, Ltd., have been successful in negotiating a contract with the British Administration in Tripolitania to carry personnel and their families between Tripoli, Libya and the U.K. Vikings and DC-3s will be used and Mitchell Cotts and Co. (Middle East), Ltd., will act as handling and booking agents in Tripoli.

* * *

Mr. E. T. Jones, O.B.E., Principal Director of Scientific Research (Air) in the Ministry of Supply, and Capt. H. T. Farnsworth, Flight Test Superintendent at B.O.A.C.'s Operational Development Unit, have been appointed assessors to assist Sir William McNair, K.C., in the public inquiry into the Llandow accident, to be held at Cardiff on May 16th.

* * *

The effectiveness of the Dehmel synthetic trainer, used by Pan American crews, would appear to be convincingly demonstrated by the fact that every member of the 95 Stratocruiser crews so far tested by the C.A.A. passed the stringent flight examinations at the first attempt. Referring to the good safety record of domestic and international U.S. airlines last year, the chairman of the C.A.B., Mr. Joseph O'Connell, attributed this achievement to training devices such as the Dehmel.

* * *

More than 4,000 bales of wool were transported to Melbourne from Tasmania by A.N.A. freighters between February 13th and March 18th. The aircraft made three trips a day, carrying 38 bales each time. In addition, woollen yarn is being flown from Tasmania to all parts of Australia at the rate of 1,000 bales per month. Freight traffic between Tasmania and the mainland has grown so rapidly in the last year that six flights a day are now made by A.N.A. freighters alone.

* * *

To facilitate the working of the Airways System which will shortly be introduced in the United Kingdom, the M.C.A. has decided to issue a new series of Radio Facility Charts. These charts, which will give full details of the air traffic control scheme and the associated radio navigation facilities, are intended for use in conjunction with the Instrument Approach and Landing Charts, and the new series will include such essential information as the location of radio-ranges, fan markers, D/F stations, meteorological broadcast stations, reporting points and minimum safe altitudes.

CIVIL AVIATION NEWS . . .

AIRLINE REQUIREMENTS in 1955

Some Views on Next-generation Transports from North America

A DISCUSSION entitled "New Appraisal of 1955 Air Transport" was held before the S.A.E. National Aeronautic Meeting at Los Angeles a short time ago, and reference was made to it in a recent S.A.E. Journal. Certain individual views are certainly worthy of consideration by manufacturers and operators in this country. The remarks and predictions of Mr. H. R. Harris, vice-president and general manager of A.O.A., in particular, may not all be new or original, but they nevertheless provide food for thought.

"What will the public be willing to pay money for in 1965?" asks Mr. Harris. "Can we build airplanes where the floors do not vibrate, the trays do not vibrate, your bathroom does not vibrate, your seat does not vibrate? Not knowing the answer I merely hazard a guess, but the public might find enjoyment in a vibrationless trip. Can't you design windows that are two or three or four times larger than the present ones? Can windows also extend downwards from the traditional height of a window ledge—down to the level of passengers' ankles perhaps—so they can see? As cabins grow larger, can't we keep them narrow with two seats on each side of the aisle . . . ? Something mysterious happens when you put 100 people all in the same cabin. Anxieties flare up more quickly in a mob than in a small group. Putting people on two, three or four different floors will keep the size of each group down as well as ensure better visibility."

Before giving his personal views on the aircraft desired for trans-ocean service in 1955, Mr. Harris continued: "Please do not attempt to design a transport for 1965, 1955, or any other time which costs more per passenger to provide service than previous transports."

Mr. Harris' personal specification includes the following requirements: A low-wing monoplane providing sleeperette-type seats for not more than 50 passengers and carrying 2,500 lb of mail and cargo in addition to 150 lb of baggage for each passenger. It must not have an extremely critical c.g. requirement. There will be separate toilet facilities for men and women passengers; the lounge will seat ten, and the galley will have storage and serving space for two meals for a full aircraft. In addition there will be plenty of space for coats, hats and other belongings. Cabin altitude will not exceed 8,000 ft, regardless of flight altitude, and the large windows will have provision for defrosting. The air exchange will be sufficient to permit smoking of pipes and cigars, at least in the lounge, and air-conditioning equipment will function in the air and on the ground, whether or not the main power plants are operating.

Preferably, the crew will comprise three pilots, all of whom are navigators, and two cabin attendants. A flight engineer will be required if the aircraft has reciprocating engines. One sleeperette chair will be available in the crew compartment. A pilot-operated radio telephone will be the only type of communication required. The aircraft will fly non-stop in either direction between New York and London with full load—the faster the better—and must be able to reach an airport from any point on route after loss of 50 per cent power. It must not require more than 6,000 ft for take-off or landing. Such an airliner must not be submitted to stacking or waiting for take-off. Straight-in approach and zero-zero landing are imperative.

Speaking for the aircraft manufacturer, Mr. Carlos Wood, preliminary design engineer of Douglas Aircraft, said that the "1955 S.A.E. Transport" must be usable for trip lengths of from 830 to 3,500 miles in order that a production quantity of at least 100 aircraft could be set up. Even more flexibility of operation was desirable if possible. It might be practicable to sell the aircraft at the 100 quantity for around 2 million dollars each if they did not get too large. He tabulated some of his assumptions as follows:—

Maximum stage length needed	3,500 miles.
Capacity, international service	50 passengers.
Capacity, domestic service	58 passengers.
Weight empty	75,000 lb.
Daily utilization	10 hours.
Passenger load factor	60 per cent.
Payload per passenger	250 lb.

Also taking part in the discussion was Mr. E. H. Atkin, chief designer of A. V. Roe Canada, Ltd. He stated that very brief experience with the Jetliner had indicated that turbojet aircraft have (1) lower drag; (2) better control (due to the absence of rotating slipstreams, air flow over the aircraft is much less turbulent and is symmetrical, which improves effectiveness and smoothness of controls); (3) greater safety in emergency landings (no airscrews); (4) decreased engine and airframe maintenance (turbojets require only 25 to 35 per cent of the maintenance that reciprocating engines do).

Mr. Aitkin also mentioned that the flexibility of operation of the jet transport could be much greater than was commonly imagined. He added that very brief experience with a prototype operated on a public airfield (Malton) for test flight purposes while the normal traffic was landing and taking-off had indicated that the bogy of jet-transport operation was nowhere near so serious as was imagined, though changes would undoubtedly be required in airport organization when jet transports were extensively used.

On the subject of power units he said that for the time being, and for the longer ranges, the turboprop had a slight advantage, but in five years turbojets would be running with fuel consumption figures of the order of 0.9 lb/hr/lb thrust and better. Then the advantage of the turbojet aircraft from every point of view would be decisive.

Also on the subject of the power units, and speaking from the manufacturer's viewpoint, Mr. D. J. Jordan, Pratt and Whitney project engineer, stated that existing jet units are small in relation to the inherent size limits of this type of power plant. Design problems of turbojets, unlike those of reciprocating engines or even turboprops, did not multiply rapidly as size was increased. Therefore it was to be expected that a major share of development effort would be directed towards increasing size and that by 1955 larger turbojets would be available. The best fighter and bomber engines would not necessarily be the best transport engines, even for military transports. It was possible that the fuel consumptions obtained by 1955 would represent the major portion of the ultimate capabilities of the turbojet type.

FROM THE CLUBS

THE Southend Municipal Flying School completed its third year on March 31st. Total flying-time for the year was 2,224 hr, making a total to date of 6,552 hr since the school's inception. In the first three months of this year, 130, 169 and 195 hr were flown respectively, including some 51 hr at night.

Three Indian students have completed their time for Commercial Pilot's Licences, but only one, Mr. D. P. Sinha, has so far taken the M.C.A. tests. Several members, who have been making steady progress during the winter months, are nearing the end of their course for the Private Pilot's Licence, which they hope to obtain in the next few weeks.

IN its first month of operation the Surrey Flying Club, which operates from Gatwick, managed to achieve over 50 hr. The club is at present operating Piper Cubs and a Fairchild Argus, but a Beechcraft Traveller will shortly be available for hire. More than 30 members are now flying.

During the Easter week-end two members took the Fairchild as far as Geneva and one of the Cubs was flown to Toussus. The Club is particularly well situated for members living in London as Gatwick Airport has its own railway station, and there are direct services to and from Victoria every 30 minutes. The membership fee is £2 2s per year and members may avail themselves of full catering and bar facilities in

a 16th-century clubhouse. By the use of Piper Cubs, flying rates are being kept as low as £2 5s solo and £2 15s dual, with special arrangements for daily hire and reduced charges for "block" bookings. Prospective members should contact the secretary, Mr. C. L. Holdup, at Gatwick Airport, near Horley, Surrey (Crawley 895).

* * *

THROUGHOUT the winter the Derby Aero Club has held uniformly successful monthly dances, and on April 1st a particularly enjoyable evening was spent when many members turned up in fancy dress. A television set has now been provided in the club-house, and, together with film shows and table-tennis tournaments, has helped to retain interest during the winter months.

Three members have recently acquired Student Pilot's Licences, and five more are in the final stages of training for their Private Pilot's Licence. Many private owners and members are now making plans for trips abroad, and the Club expects to be strongly represented at the forthcoming Continental rallies. Plans for Derby's At Home and Air Display on June 3rd are going ahead, and will be announced in the near future.

* * *

ALTHOUGH the news is probably cold comfort to less fortunate British enthusiasts, it is nevertheless interesting to learn of the official recognition which is being accorded to the private flying movements in other parts of the world. The Australian Minister of Civil Aviation, for instance, has announced a new scale of subsidies which will be given to flying clubs. The scale provides for increases in the present subsidy rates, provision for A.T.C. flying training, and State assistance in the replacement of obsolete and worn-out aircraft; the promotion of clubs in remote areas is also being encouraged.

Details of the scheme have not yet been announced, but the Minister has stated that he will remove many of the restrictive regulations which are still in force. He has expressed himself as being "staggered at the present restrictions" and has pointed out that a member of the House of Commons who flew in his own aircraft from Queensland took longer to complete the required forms on departure and arrival than he did to make the trip from Brisbane to Canberra.

* * *

FROM another corner of the world, Newfoundland, comes the news that plans are being made for a large-scale celebration in St. John's on June 24th to mark the opening of Newfoundland's first flying club; the club will be affiliated to the Royal Canadian Flying Clubs' Association. The event will also be celebrated in Canada, and T.C.A. officials have offered to fly the Premier of Newfoundland to the capitals of each of the nine other Canadian provinces. The R.C.A.F. and the R.C.N. are also being asked to take part in the festivities. June 24th has been chosen, as it marks the anniversary of the day on which Cabot discovered Newfoundland.

* * *

MARCH was once more a rather bad flying month for Wiltshire Aero Club, which achieved a total of only 97 hr. Although the reduction in flying rates has induced several members to take out "block" flying tickets at £2 an hour, there are still several units of 5 hr available.

A flying display scheduled for Easter Monday afternoon in conjunction with the motor cycle races held at Thruxton had to be cancelled owing to the bad weather; Mr. J. E. Gwynne-Jones gallantly volunteered to give his usual parachute jump, and was only restrained from doing so by a concerted effort on the part of club members.

A member, Mr. Geoffrey Marler, has purchased and will fly a Miles Messenger in the King's Cup Air Race. Preliminary plans for the Thruxton Air Races (to be held on Saturday, August 26th) are now being made. This year there will be only two races, one for standard Auster Autocrats and the other the well-known Thruxton Trophy Race to the Isle of Wight and back. A varied and attractive programme is being arranged for the flying display which will be held on the same afternoon.

GLIDING NEWS

CONDITIONS were excellent when Mr. Lorne Welch, of the Surrey Gliding Club, and F/L. Miller, of the R.A.F. Gliding Club at Detling, made the Channel crossings referred to briefly in *Flight* last week. Mr. Welch's flight (in an Olympia from Redhill to Melsbroeck, Brussels—a comfortable Gold Badge distance) was a most praiseworthy performance. After being towed off he waited for about an hour and a half in the Folkestone-Dover area, gaining a prudent 8,500ft over Dover before setting course for the Continent. He was retrieved from Brussels a few days later by the club's Auster, flown by Mrs. Ann Douglas.

F/L. Miller was unfortunately late in getting off from Detling in his Gull I, and only succeeded in reaching the Belgian coast. It was his second interesting experience in the past few weeks. On an earlier flight he had encountered severe icing conditions; he emerged from cloud to find himself some two miles out over the sea, with a very strong offshore wind. Flying just above the wave tops, he managed to make a landing on a steep bank of shingle at Folkestone, only ten feet from the water's edge.

* * *

On April 14th an unfortunate (and unnecessary) accident occurred to the Newbury Eon, which had landed at Lympne with an Olympia. The pilot of the glider was sitting in his machine, which was attached to the aircraft tow-rope. When the tug-pilot attempted to swing the Eon's airscrew the engine started and the unoccupied aircraft ran forward. A belated attempt to board the Eon was unsuccessful, and the sailplane pilot just had time to "bale out" before both machines ran through a hedge and sustained severe damage.

* * *

Another recent flight of interest was that by Mr. G. H. Stevenson, who, in an Olympia, established a new British out-and-return record with a distance of 126 miles—from Redhill to Thruxton and back. This record is still subject to confirmation.

* * *

Under recent amendments to the Air Navigation Order, 1950, concerning gliding, persons under 16 are now permitted to fly more than three miles from base, but must be under the supervision of their club. This means, in effect, that a young person will now be able to attempt his Silver Badge distance when his club considers conditions are suitable.

WELCOME IMMIGRANT: The first post-war glider to be imported by New Zealand—an Eon Olympia—is now flying with the Auckland Gliding Club. Mr. G. Hookings (second from left) who is part owner of the Olympia, is seen with Mr. R. J. Prentice, chief instructor of the Auckland Aero Club, before an aero-tow launch on one of its first flights. These sailplanes are built by Elliotts of Newbury, Ltd.

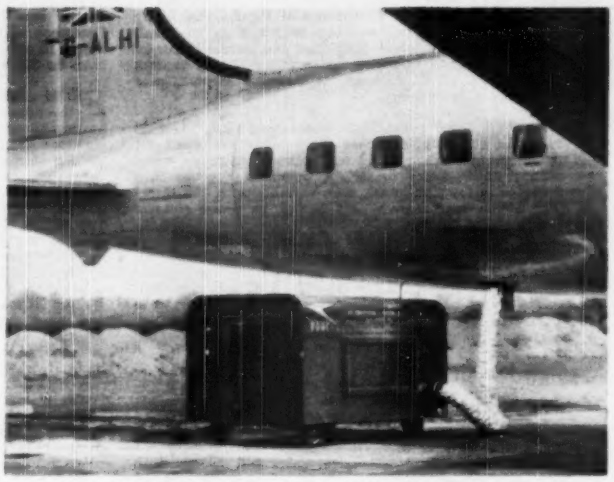
By a curious oversight in the original Air Navigation Order, it was deemed illegal for a glider to be occupied when being towed by an aircraft. The anomalous situation whereby offenders would be liable to a large fine and/or imprisonment has now been rectified in an amendment to Article 41.

* * *

The report of the annual general meeting of the London Gliding Club contains some interesting details of last year's operations. With 279 flying members, the club is the largest in the country. Totals of 10,270 launches and 2,415¼ flying hours were recorded last year; this represents a large proportion of the figure recorded by all members and associates of the B.G.A. The London Gliding Club is now in a flourishing condition and, if progress achieved during last year can be maintained, there is every reason to suppose that the club's deficit of £542 last year will be completely eliminated in 1950.

CABIN COMFORT LAID ON

Details of the Godfrey Ground-Conditioning Truck for Aircraft



The new Godfrey ground-conditioning truck is here shown connected to a B.O.A.C. Canadair Four.

ANYONE who has ever had occasion to sit in an aircraft on a tropical airfield will know very well how uncomfortable an experience it can often be. Despite the wall and roof insulation with which most modern aircraft are equipped, the cabin rapidly takes on the thermal characteristics of a *hammam*. In order to mitigate this effect, ground-conditioning equipment of various kinds has been devised.

As in the tropics aircraft interiors need cooling whilst on the ground, so conversely, in arctic conditions static heating is required. (The use of the adjective "arctic" is a convenience, for whilst in Great Britain the winters can be chilly enough, in Canada, the U.S.A. and Scandinavia, for example, temperatures below freezing are seasonally the rule rather than the exception.) In addition to the business of heating or cooling the interior of the aircraft whilst at rest, the increasing use of cabin pressurization makes necessary the routine check-testing of the pressurizing equipment and, of course, the pressure-retention capacity of the structure.

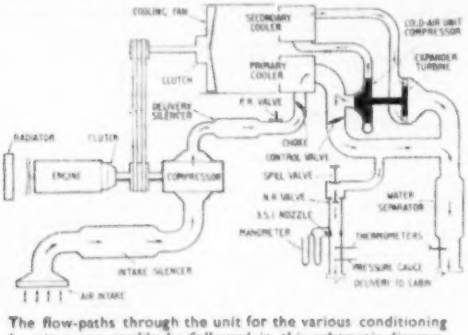
In collaboration with B.O.A.C., a universal ground-conditioning unit has been designed and manufactured by Sir George Godfrey and Partners, Ltd., Feltham, Middlesex, so far as we are aware, it is the only unit in the world that is capable of fulfilling, at need, all the demands of aircraft ground-conditioning and pressure-testing, irrespective of climatic extremes. The comprehensiveness of such a performance is rendered possible only by the use of air as the working medium.

As may be seen from the heading photograph, the unit is a compact, pneumatic-tyred truck—which, being only 5ft 7in high, 5ft 10in wide and 10ft 6in long, is readily capable of transport by air—and is made ready for use simply by connecting the flexible duct of lagged canvas between the ground-conditioning connection on the aircraft and the appropriate delivery outlet on the truck. Power for driving the unit's Roots-type Marshall blower is derived from a Rolls-Royce B80 straight-eight engine, which develops 150 b.h.p. at 3,000 r.p.m. Torque is transmitted through a Borg and Beck clutch and a flexible coupling, and the engine is complete with 12-volt dynamo and starter motor, air filter and ignition screening.

Inducted air, having passed through the intake silencer, compressor and delivery silencer, is led past a pressure-return valve (which protects the compressor and ducts) to a choke valve which, by varying back-pressure, can be used to regulate temperature. Thence, the air is delivered through the primary cooler, downstream of which it is either directed through the air-cycle turbine cold-air unit or permitted to by-pass that unit, according to the function required. There are two branches in the delivery, one of which, furnished with a spill-valve, non-return valve, B.S.I. nozzle, manometer, thermometer and pressure-gauge, is used for pressurization testing, whilst the other branch, in which are incorporated a water separator and a thermometer, is used either for heating or cooling the cabin; the branch not in use is sealed-off by a blanking cover at the delivery port.

If the aircraft cabin requires to be heated, the cooling fan is disengaged by means of a clutch and the choke valve partially closed, whilst the control valve will be opened so as to by-pass the cold-air unit. The maximum heating delivery in this condition is 200,000 B.T.U.s/hr. When cooling is required, the choke valve is opened, the cooling fan engaged, and the control valve closed so as to bring the cold-air unit into the circuit. Between the compressor of the cold-air unit and the turbine, the air is ducted through a secondary cooler, so that, in expanding through the turbine, its temperature is very considerably reduced. Temperature can, in fact, be reduced from an intake ambient of 120 deg F. down to a delivery temperature of 37 deg F., the flow volume being 1,500 cu ft/min. The pressure-testing capacity of the unit is up to a differential of 12 lb/sq in for an aircraft cabin of Brabazon size.

On Thursday, April 20th, a demonstration of the Godfrey truck's conditioning capabilities was given at London Airport, a B.O.A.C. Canadair Four serving as the "conditionee." A large number of people, including high-ranking officers and engineers of B.O.A.C., B.E.A. and many of the foreign operating companies, witnessed a very impressive display. Immediately following the demonstration, the truck was despatched in a York freighter aircraft to Calcutta, where it is to be tested by B.O.A.C. on incoming and outgoing aircraft.



The flow-paths through the unit for the various conditioning functions can readily be followed in this schematic diagram.

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FLYING-BOAT versus LANDPLANE

A Second Contribution on a Controversial Subject

IN introducing an article, "The Case for the Flying-boat," in last week's issue, we hinted that there were loopholes by which protagonists for the landplane might penetrate the writer's case for the defence. Now, in the accompanying notes, an advocate on the same side hastens to fill the breach, maintaining that the case could have been argued more effectively. The writer, who prefers to remain anonymous, has for many years been associated, in a responsible position, with flying-boat construction.

A SOUND principle, like an innocent man, can all too easily be condemned by an otherwise impartial jury if the counsel for the defence produces evidence which is erroneous or, what is worse, deliberately misleading.

The author of "The Case for the Flying-boat" is convinced, quite rightly, that flying-boats are a good thing but his excursions into the realm of facts and figures in his attempts to prove his point are so obviously at fault that they may well have the effect of causing the reader to become influenced against the flying-boat before he has really studied it.

In his well-intended efforts to show that landplanes and flying-boats are comparable from the point of view of direct operating costs, the writer gives a comparison, between the cost calculations of a landplane and a flying-boat, which is grossly unfair. He does not tell us what these two aircraft are, but this extract from his table contains significant facts:—

	Flying-boat	Landplane
Stage speed (kt)	168	213
Total fuel consumption (gal) ..	1,712	1,758
Total weight of fuel and oil carried (lb)	15,450	16,700
B.O.W.+fuel and oil and crew (lb) ..	65,782	82,300
Payload (lb)	13,218	13,740

My criticism of these figures is as follows:—

(1) The difference in stage speed proves that the landplane is a much more advanced design than the flying-boat.

(2) Although there is apparently only 16 gal (115lb) difference between amounts of fuel *used* by the two machines, a difference of 1,250lb (174 gal) is quoted for fuel *carried*.

As the allowances quoted for diversion, etc., are the same for both aircraft, one of these figures must be wrong. As they stand, the landplane is penalized by about 1,000lb weight.

(3) The all-up weight of the two aircraft, from the figures quoted, appears to be:—

Landplane ....82,300 + 13,740 = 96,040lb
Flying-boat ....65,782 + 13,218 = 79,000lb

It is a little difficult to swallow the alleged fact that a landplane, carrying virtually the same payload as a flying-boat, should weigh 17,000lb more!

[Judging from the weights quoted by our original contributor it appears that the comparison chosen was that between a Solent IV and a Constellation 649, in which case the 17,000lb difference in all-up weight for the same payload was essentially correct. The maximum seating capacity of a 649 is normally 44 on long-range stages; for example, Air France offers this capacity on its non-stop service from Paris to Lydda. The next of the longer-range Constellations, the Model 749, has, of course, a maximum a.u.w. of 105,000lb.—ED.]

It would seem that your contributor has done one of two things. Either he has only partially filled the landplane or he has deliberately chosen one which is intended to operate over a much greater range. Supporting evidence for the latter is found in his opening remarks, where he writes of a comparison between a flying-boat used by T.E.A.L. (Sydney-Auckland, 1,167 nautical miles) and a landplane in operation on the transatlantic route.

Quite obviously, the only significant comparison which can be drawn between the landplane and the flying-boat on a cost basis is one which compares two aircraft of similar technical quality which have been designed for the same range.

The fact that your contributor has arrived at approximately the right answer (a parity in cost per ton-nautical-mile and per passenger-nautical-mile—this should be pence, by the way, not pounds!) [it was an error in transposition, for which our contributor was not to blame—ED.] is overshadowed by the fact that he has compared an indifferent flying-boat with an unfairly penalized landplane.

Economy with Size.—The curves illustrated in the article, which purport to show a peak in economy at an all-up weight of about 250,000lb for a range of 2,800 nautical miles, completely defeat me. My own studies of the problem lead me to the same conclusion that was reached by Sir Arthur Gouge in his Wilbur Wright lecture—namely, that the most economical aircraft for any route of any length is the biggest aircraft which the traffic potential will fill. I can find no technical evidence at all which does not show a steady improvement in direct operating cost with increased size.

Structure Weight.—Up to an all-up weight of about 80,000lb the structure of a flying-boat weighs a little more than that of the corresponding landplane. Between 80,000lb and 150,000lb there is little to choose between them. Over 150,000lb the flying-boat wins by an ever-increasing amount as size increases. The reason is, of course, that whereas the undercarriage weight remains approximately a function of the aircraft weight, the additions to the fuselage which make it into a hull become smaller, and consequently lighter, in proportion to the weight of the aircraft as the latter increases.

Drag.—For two aircraft having the *same weight and loadings*, designed for the *same accommodation*, the flying-boat will have a drag some 7 to 10 per cent greater than the landplane. This is due to the hull bottom. As the size under consideration gets bigger, however, the flying-boat's gain in weight economy reduces its drag until a stage is reached, as your contributor points out, where the landplane is beaten.

Economy.—The difference between the direct operating costs of landplane and flying-boat, if designed to the same technical standards, is negligible. In the smaller sizes the landplane has the advantage; in the larger sizes the flying-boat wins. The significant fact is that direct operating costs fall with increasing size *whether you use a landplane or a flying-boat*.

As things are to-day, the world is smothered with airfields and has but a few marine air bases. Of all these airfields, however, there are mighty few that can handle an aircraft of 150,000lb—not due to its take-off run so much as its *weight and size*. When you compare the initial cost of new runways and buildings with new marine air bases the answer is obvious.

If the cost of renewing runways and buildings to a standard suitable for large landplanes is considered prohibitive and, in consequence, aircraft size is kept down, then the first firm or country which is sufficiently enlightened to put on really large flying-boats will be able to reduce its fares to such an extent that the smaller landplanes will be out of business.

Our forebears who laid the foundations of our great Mercantile Marine were not frightened of expending effort on building docks all over the world. If we have the courage to emulate them to-day and build marine air bases capable of handling not only the Princess but far greater flying-boats, we can ensure that, in twenty years' time, Britain's Mercantile Aviation will be right out in front.

FORTHCOMING EVENTS

April 27. R.Ae.S.: "High-speed Research in the Aerodynamics Division of the N.P.L." by J. A. Beevan, M.A. (Cantab.), A.F.R.Ae.S., and D. W. Holder, D.I.C., A.C.G.I., B.Sc. (at Manchester).
May 4 R.Ae.S.: Third Louis Blériot Lecture, by Sir Frederick Handley Page, C.B.E., F.I.Ae.S., Hon. F.R.Ae.S. (in Paris).
May 14. R.Ae.S. Garden Party, White Waltham.
May 16. Aero Golfing Society: Flight Cup Meeting, St. George's Hill.
May 19. Bomber Command Night, Royal Albert Hall.
May 19-21. Air Tour of Sicily.
May 20. Northamptonshire Aero Club: At Home.
May 20-21. Yorkshire Aeroplane Club: International Rally, Sherburn-in-Elmet.
May 25. R.Ae.S.: 38th Wilbur Wright Memorial Lecture, by Sir Richard Fairey, M.B.E.
May 27-29. Champagny Rally, Epernay-Plivot.
May 27-28. Bembridge and Sandown Aero Club: Rally.
May 28-29. Ailes d'Azur Rally, Cannes.
May 29. West London Aero Club: S.S.A.F.A. Display, White Waltham.
June 2-4. Tyrol Rally, Innsbruck.
June 3. Derby Aero Club: "At Home" and Display.
June 3-4. "Wines of Anjou" Rally, Angers.
June 3-4. Ultra Light Aircraft Association: Rally Fairwood Common.
June 4. F.A.I.: General Conference, Stockholm.
June 4. Aero Club of Normandy: Aerobatic Competition.
June 4. Ragosine Trophy Navigation Competition, Rearsby.
June 10. Blackpool and Fylde Aero Club: At Home.
June 10. Darlington Flying Display.
June 10. Yorkshire Aeroplane Club: International Rally, Sherburn-in-Elmet, Leeds.
June 10-25. Brussels International Aeronautical Exhibition.
June 11. Fête Adrienne d'Orly, Paris.
June 15-18 Benelux Air Tour.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Memories of the Sidestrand

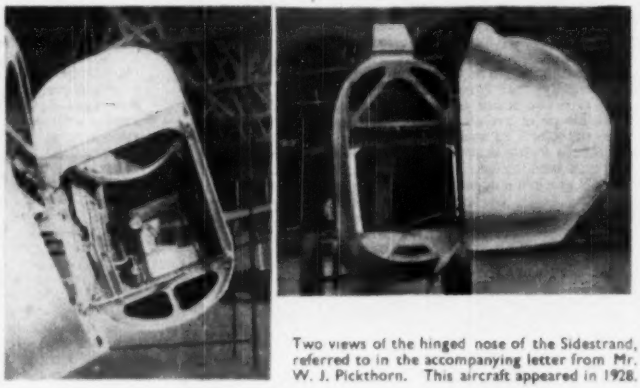
APROPOS S/L. H. R. Bunn's letter published in *Flight* of April 6th, your readers may be interested to see the enclosed two photographs of the hinged nose on the Sidestrand. One of them shows how the bomb-release levers and cables were folded up into the fuselage out of the way of mechanics working on the nose.

The swinging engine mounting also mentioned by S/L. Bunn was, of course, first introduced by Boulton Paul in the all-metal P.10 exhibited at the Paris aero exhibition in 1919. Unfortunately I have no photographs left illustrating this feature of the Sidestrand.

W. J. PICKTHORN,
Boulton Paul Aircraft, Ltd.

Wolverhampton.

[We recall that the Bristol ten-seater of 1923 also had a swinging engine-mounting.—ED.]



Two views of the hinged nose of the Sidestrand, referred to in the accompanying letter from Mr. W. J. Pickthorn. This aircraft appeared in 1928.

Surplus Tigers

I WAS most interested to see the page "Curtain Call for the Tiger" which appeared in your issue of April 13th. It appears as if nobody wants the Tiger Moth any more, except for new flying groups which cannot afford the initial outlay for new aircraft. No doubt these surplus aircraft are destined for the same fate as the surplus E.F.T.S. Tigers, namely, the fire-heap. To those who are responsible for the disposal of these machines I would say that there *will* be a time when Moths will be extinct—through lack of spares and also lack of Moths! Has anyone visualized the position of Britain's light aircraft fleet ten years hence—no Magisters, Moths, or anything in the 1,000-1,500 lb weight category?

As a rough estimate, at least 150 Tiger Moths must have been disposed of by the R.A.F. alone, and the V.R. will soon have no use for them. Surely there must be dozens of flying groups itching to get their hands on such aircraft. Admitted, the Tiger is by no means low on fuel consumption, but a commercial group could easily get the rates down to a reasonable level. It is obvious to any club member that the main problem in commencing a club is the initial outlay, usually £400-£500, for a reliable aircraft.

The plain facts are: Tiger Moth aircraft in excellent trim are surplus to Government requirements. They are needed by our clubs and groups, so much neglected in the past. Perhaps a fairy Godmother really does exist in the Air Ministry? That will be proved by the fate of these excellent training aircraft.

LEWIS G. COOPER.

Coventry

WILLIAM A. WHITE.

[We believe that the official attitude would be that when these aircraft are "reduced to produce," some of the produce (e.g., engines) is very profitable.—ED.]

Speed, Load and Diesels

WITH reference to your article "The Value of Speed" in the issue of April 13th, I should like to point out, in the first place, that you cannot compare the performance of the *Queen Elizabeth* with the Comet because the *Queen Elizabeth's* chief cargo is not a mere handful of passengers (2,200), but freight occupying some 60,500 cu. ft. of space. However, during the war she carried troops in large numbers and was fitted out as a troop carrier, in which case she probably carried 20,000 men, plus large quantities of war materials. Under those circumstances you might arrive at a fair comparison, although the point that arises here is how many passengers she would carry if she was fitted out, like the Comet, for passengers only.

Secondly, you state that "the Comet operates at a cruising speed nearly 200 m.p.h. faster than that of other aircraft." but is that really the case when the aircraft is fully loaded? The flight to Rome and back gave an average speed of roughly 415 m.p.h. with 15 passengers up, but would the speed with a total of 40 up (with luggage) not be reduced to 425 m.p.h.? And what would the specific fuel consumption be then?

The latest piston-engined aircraft seem to cruise at speeds of 325 to 350 m.p.h. With diesel engines of 2,500 h.p. each, which cruise with more throttle than the petrol engine does, the speed would be increased, no doubt, to 375 m.p.h. when cruising with a specific fuel consumption of 0.35 lb/h.p. hr.

The jet engine will have a fuel consumption of not less than 0.7 lb/h.p. hr. or double that of the diesel aircraft engine. This means carrying double the amount of fuel, which represents a considerable weight. However, I think that all engineers would prefer the turbine form of engine to the petrol reciprocating piston engine, because of its smoother running, speed for less overhaul and considerably safer and cheaper fuel.

The petrol engine is really completely out of date for the simple reason that its fuel price with tax in this country is £53 per ton [increased by the Budget tax since this was written.—ED.], which is a ridiculous price for any transportation undertaking to pay for fuel. Railways, for instance, run on a fuel (coal) which costs only £2 7s 6d per ton and is considered very high priced at that. Diesel fuel is £24 per ton with tax—the tax [also now increased.—ED.] doubles the price. Turbine fuel cost would be slightly higher.

It seems to me, therefore, that the best engine for civil aviation is the diesel, which gives a higher cruising speed than the petrol engine, and overcomes all fire risk.

The jet unit will not carry heavy loads at speed and should be used specifically for mail services. It would be sheer extravagance to use it for passenger service, as the fuel consumption at 500 m.p.h. would be three times that of the diesel aircraft engine at 375 m.p.h.

J. R. GROULD (Major).

Westcliff-on-Sea, Essex.

[Our correspondent errs in his estimate of speed reduction with full load; in the case of such a "clean" aircraft as the Comet the difference would be very much smaller. As regards the diesel, its possibilities for aircraft use would be worth considering only if it had received such long and intensive development as has the aircraft petrol engine. It received a fair trial before the war—particularly in the hands of the Germans—but its weight and its inability to offer a large margin of take-off power have always counted against it.—ED.]

Flying-boat Fires

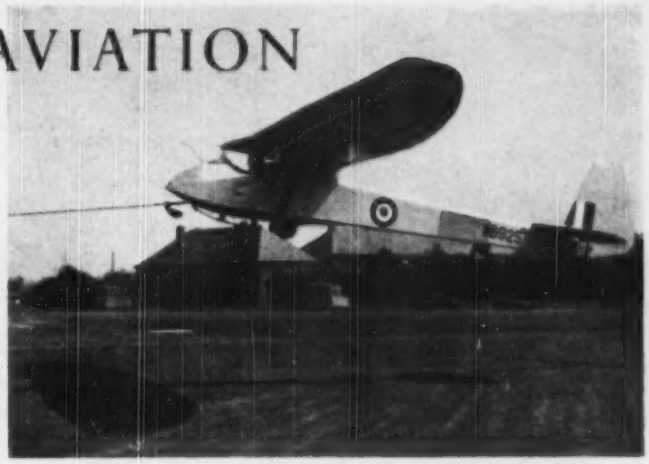
YOUR interesting description (March 30th) of fire-floats for fighting flying-boat fires leads me to ask if any reader can supply information concerning the number and frequency of civil flying-boat fires, especially during take-off, alighting or taxying. I am anxious to assess the incidence of fire risk when flying-boats are in normal operational movement, rather than that caused by crashes or during refuelling.

ICARUS.

Bexley, Kent.

SERVICE AVIATION

Royal Air Force and Naval Aviation News and Announcements



DUAL TRAINER : Slingsby Sedbergh trainers, now being delivered, form a useful and welcome addition to the gliding equipment of the A.T.C. Piloted by F/L. Marsh, C.O. of the Gliding School at Kenley, one of the new two-seaters is being winch-launched.

New C.F.E. Commandant

AIR COMMODORE W. J. CRISHAM, C.B.E., is announced as the new Commandant of the Central Fighter Establishment; he succeeds A.V.-M. D. F. W. Atcherley, C.B.E., D.S.O., D.F.C., who is now Senior Air Staff Officer at Fighter Command H.Q.

The new Commandant, who is 43, spent most of his war service in Fighter Command. He commanded, successively, 23 Squadron (night intruders) and fighter sectors at Kirton-in-Lindsay and Tangmere. In September, 1944, he joined 11 Group H.Q., and, early in the following year, became Air Officer in charge of Administration, Second T.A.F.

R.A.F. and Royal Tournament

ONE of the most successful features of last year's Royal Tournament at Olympia, a display of R.A.F. parachute training in all its stages, will again be a part of this year's pageant—to be held at Earls Court from June 7th-24th inclusive. Over 130 instructors of No. 130 Parachute and Glider Training School, Upper Heyford, will take part.

This year the Air Force will also provide the massed bands display, consisting of the Central, Regional and W.R.A.F. Bands. Members of the R.A.F. Regiment will demonstrate continuity drill—demanding teamwork and precision without words of command—and the R.A.F. will also be represented in the guard of honour and P.T. exhibition.

R.A.F. Regatta

THE ROYAL AIR FORCE ROWING CLUB will hold its annual regatta near Caversham Bridge, Reading, on Saturday, May 6th, at 2 p.m.

R.A.F. Survey in Africa

EXCEPT for a short break in 1947, the Lancasters of No. 82 Squadron, R.A.F., have been engaged on photographic survey work in East and West Africa since the beginning of 1946. They have photographed 420,000 square miles of the African continent, including 60,000 square miles of Kenya and Uganda in the last two months alone. Previously, they had operated over the Gold Coast. The transcontinental move was made with the assistance of Transport Command, which provided Hastings for lifting groundcrews and stores (*Flight*, March 23rd).

Four 82 Squadron Lancasters recently set out from Nairobi to begin survey work in Tanganyika and the Protectorates of Basutoland and Bechuanaland. Two of the Lancasters, based on Tabora, in Western Tanganyika, will photograph an area in which a link between the railways of Tanganyika and Kenya is projected. This operation, if adverse weather conditions do not interfere, will probably be completed by mid-August.

The other Lancaster detachment, flying to the Transvaal, will establish its base at the South African Air Forces H.Q. at Zwartkop, near Pretoria. Within a month, once again if the weather is favourable, they will photograph the whole of Basutoland before moving to Bechuanaland. Desert covers much of this country, and it is only the populated south-eastern region that the Lancasters will concentrate upon in two months of operations. This assignment over, the two Lancasters will fly to Tanganyika to assist in the rail-link photography.

Two Dakotas will fly in to the detachments such photographic equipment and ground personnel as the Lancasters themselves are unable to carry. Throughout the operations, these aircraft will circulate each area weekly, flying films to Nairobi and aircraft spares and supplies to the detachments.

CHIPMUNK CHECK-UP : Mr. Aidan Crawley, the new Under-Secretary of State for Air, last week visited No. 1 Reserve Flying School at Panshanger, Herts. He is shown inspecting one of the School's Chipmunks, accompanied by W/C. C. A. Pike, A.F.C., who has been C.O. at Panshanger since 1935, and an instructor since 1927.

New A.T.C. Trophy

ALTHOUGH he retired from the R.A.F. last October, as A.O.C.-in-C., Reserve Command, Air Marshal Sir Alan Lees has maintained a close link with the A.T.C. by presenting to the Corps a silver cup, for competition between all squadrons unattached to schools.

The cup will be awarded to and held for a year by the most efficient squadron during the preceding 12 months; the first presentation will take place next Christmas. Marks will be awarded for good discipline, dress and general turn-out, maintenance of kit and equipment, and

SERVICE AVIATION . . .

close liaison with affiliated R.A.F. squadrons.

There are at present in the United Kingdom 654 open squadrons of the Air Training Corps, of which 327 have now a strength exceeding 50.

A Second Australian C.A.G.

AFTER a period of land-based training in this country, the Second Carrier Air Group—No. 21—to be formed for the Royal Australian Navy will embark in H.M.A.S. *Sydney* at Portsmouth in July. Before sailing for Australia in October, the Group will continue training on board ship. With the exception of eight R.N. officers the aircrews of No. 21 C.A.G. are all Australian. Commanded by Lt. Cdr. T. W. Harrington, D.S.C., R.N., the Group consists of 808 Squadron (Sea Fury) and 817 Squadron (Firefly).

R.A.F. Appointments

THE Air Ministry announces the appointment of A.Cdre. H. D. Sprackley, O.B.E., as Director of Operational Requirements (B). He spent last year as a student at the Imperial Defence College, and was formerly Commandant of the Empire Air Armament School.

A.Cdre. Sprackley began to specialize in armament in 1927, and his experience in this field includes war-time assistance, as a member of M.A.P., to the Americans in arming their aircraft for combat in Europe. For this work he was awarded the American Legion of Merit, in the degree of Commander. He joined the R.A.F. as a boy in 1920, and later won a cadetship at Cranwell, from which he was commissioned in 1925.

It is also announced that A.Cdre. L. T. Pankhurst, C.B.E., has been appointed Air Officer Commanding at Air H.Q., East Africa. A.Cdre Pankhurst recently completed two years as Director of Command and Staff Training at the Air Ministry. He was previously, for two-and-a-half years, Assistant Commandant of the R.A.F. Staff College. Born in 1902, he entered the R.A.F. on a short-service commission in 1925 and received a permanent commission four years later.

South African Record

A VAMPIRE of the South African Air Force last week set up a new record between Cape Town and Pretoria, flying at an average speed of 516 m.p.h. It made the 980-mile trip in 1 hr 54 min, compared with the time of 2 hr 16 min taken by a Mosquito in 1947.

Value of the A.T.C.

AIR Ministry appreciation of the valuable pre-Service work done by the A.T.C. was expressed at a London conference recently, the first of a series of group gatherings to be held in various parts of the country. Addressing 200 delegates, Mr. Arthur Henderson, Air Minister, revealed that, in 1949, 25 per cent of the R.A.F.'s aircrew intake had come from the A.T.C., as had a fifth of its apprentices and nine per cent of ground crew. The present strength of the Corps was, he said, over 42,000. During the past three years, 11,000 cadets had gained their proficiency certificates.

The Air Member for Personnel, Air Marshal Sir Leslie Hollinghurst, emphasized the need to increase the number of proficient cadets—at present nine per cent of the Corps—who held a marked advantage over other entrants. Quality, not quantity, should be the A.T.C.'s immediate aim. Air Marshal R. M. Foster, the A.O.C.-in-C., Reserve Command, mentioned some of the attractive experiences—all free—available to cadets to-day, such as the exchange scheme with the U.S.A. and Canada and the new flying scholarships.

Activity in Malaya

BETWEEN April 15th and 18th, aircraft of Far East Air Force made 97 sorties against bandits hiding in a tract of hilly jungle north-east of Broga, Malaya. Targets were attacked daily by Lincolns—bombing from a high level—and Brigands, Tempests and Spitfires, which made low-level strafing attacks with bombs, rockets and guns.

In addition, Sunderlands took part in the second day's activity. All the attacks were made in co-operation with ground security forces. During the same period, Tempests and Spitfires were also in action against targets in Negri Sembilan and Pahang.

Sport at Shallufa

SHALLUFA, in the Canal Zone, is—from a recreational viewpoint—one of the best-equipped R.A.F. stations in the Middle East. The station has two excellent soccer pitches and a practice pitch; a hockey ground; tennis courts for all ranks; squash court; badminton court; softball-baseball diamond; fencing equipment; and table-tennis and darts.

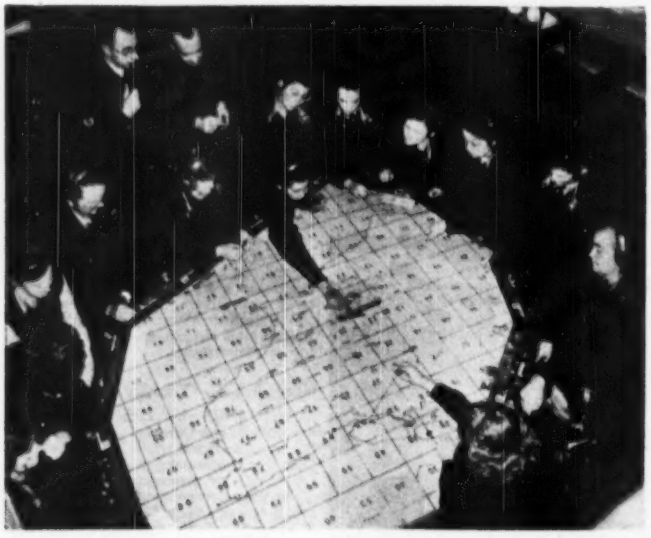
A gymnasium and swimming pool are in course of construction, and a golf course is being laid out. The swimming pool, started last October, is nearly completed. Water for the pool, pumped from the nearby Sweetwater Canal, will pass through a filter plant. It is hoped soon to establish a motor cycle speedway for a sport which has lately become very popular with the R.A.F. in the Canal Zone.

Training National Servicemen

THE present system of selecting National Servicemen for the various trades open to them is showing good dividends, judging from a recent Air Ministry report. Trade training failures have been greatly reduced by a more careful selection policy: entrants are not allotted trades until the fifth week of their recruit training, following a comprehensive procedure of tests and interviews. In the immediate post-war period, conscripts were selected at the reception unit after tests and one brief interview. Consequently, airmen often proved quite unsuitable for, and reluctant to undertake the duties chosen for them.

Nowadays, says the Ministry, 85 per cent of National Servicemen are picked for one of their first three choices of trade. Special staffs for personnel selection are maintained at the five recruit centres responsible for initial training of National Servicemen—at Henlow, West Kirby, Bridgnorth, Wilmslow and Padgate.

During their stay at these stations, men of school-certificate standard may volunteer for special National Service Commissions in the Fighter Control, Secretarial or Equipment Branches, or the R.A.F. Regiment. Those wishing to spend their 18 months' service in aircrew training make application immediately they enter the service, as do suitably qualified men eligible for Technical or Education commissions. All National Servicemen may apply, at any time, for regular aircrew engagement, short service commissions or Cranwell cadetships.



THE HUMAN ELEMENT: Despite the many advantages of modern radar in detecting the approach of hostile aircraft, visual observers still play an important part in Britain's system of defence—particularly in plotting intruders. Seen at work in a plotting centre, during the recent "silver jubilee" exercise, are members of No. 1 Group, R.O.C. Problems affecting the R.O.C. today were discussed in last week's *Flight*.

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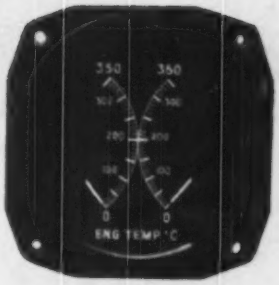

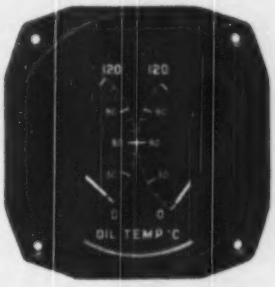

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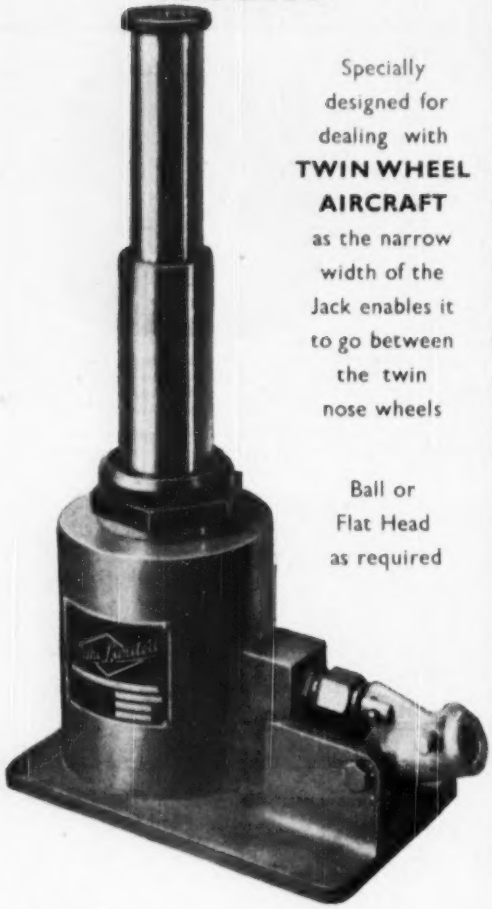

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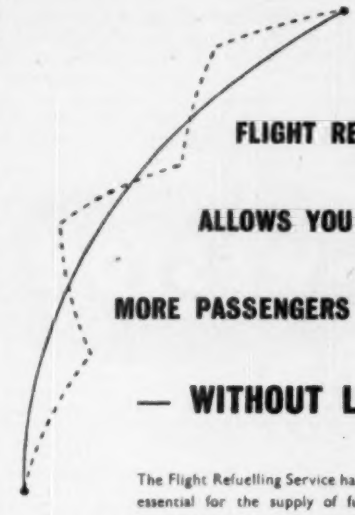

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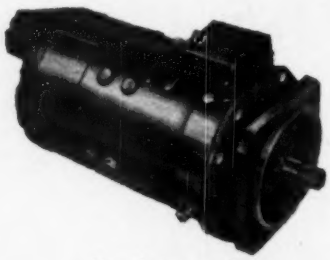

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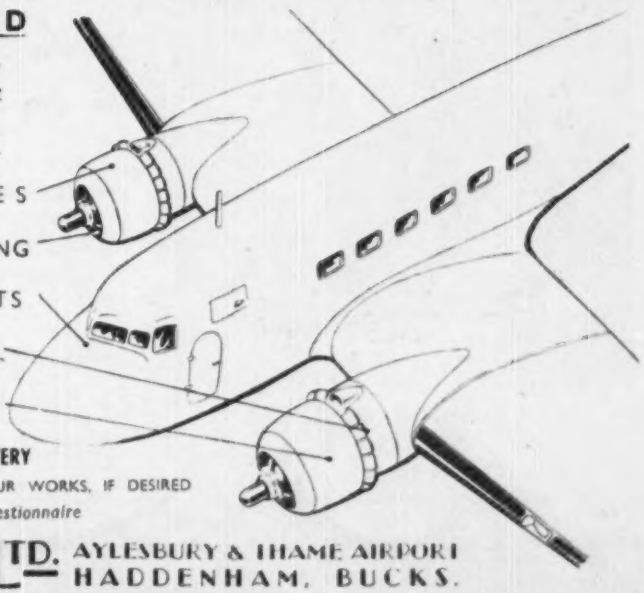

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ELECTRICIANS required for repair of aircraft electrical services; clean interesting work with good conditions.—Apply Brooklands Aviation, Ltd., Bywell Repair Factory, Bywell, Northampton. [4899

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RADIO officer required for overseas contract; must hold First Class Radio-Telegraphy licence.—Write, giving full particulars, to Airwork, Ltd., Middle East Department, Sutton Lane, Langley, Bucks. [4896

APPLICATIONS are invited from design draughtsmen and stressmen, also technical assistants with combined design and performance experience for work on both reciprocating and gas turbine aero engines.

APPLICATIONS should state full particulars of experience and qualifications and should be addressed to The Personnel Manager, The de Havilland Engine Co., Ltd., Stonegrove, Edgware, Middx. [0575

EXPERIENCED navigation/meteorological lecturer required for reserve flying school; lodging accommodation only available.—Applications giving full details of experience to C.F.I., No. 22 R.F.S., Cambridge. [4898

WANTED, skilled operator for SP5 aerial survey equipment.—Reply stating experience on SP5 and allied equipment, overseas appointment; good salary and prospects for experienced operator.—Reply Box 5472. [4923

TECHNICAL illustrator (male) required, aged 23 or over, considerable experience essential.—Applications in writing, stating age, experience and salary required, to Personnel Manager, Percival Aircraft, Ltd., The Airport, Luton, Beds. [0562

GLOSTER AIRCRAFT Co., Ltd., require an experienced Aerodynamicist; good salary offered to the right man.—Apply, giving full details of age, experience, qualifications and salary required, to the Chief Designer, G.A.C., Ltd., Hucclecote, Glos. [0577

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RUNWAY controller (junior) required by The Fairey Aviation Co., Ltd., at White Waltham airfield; some experience of knowledge of airfield procedure is essential; salary dependent on experience and age, which should not exceed 25 years.—Reply in writing to Personnel Manager, The Fairey Aviation Co., Ltd., Hayes, Middx. [4904

APPLICATIONS are invited from senior and intermediate design draughtsmen, experience of aero engine design desirable but not essential; please write, stating age and giving details of previous experience in chronological order, to—The Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [4940

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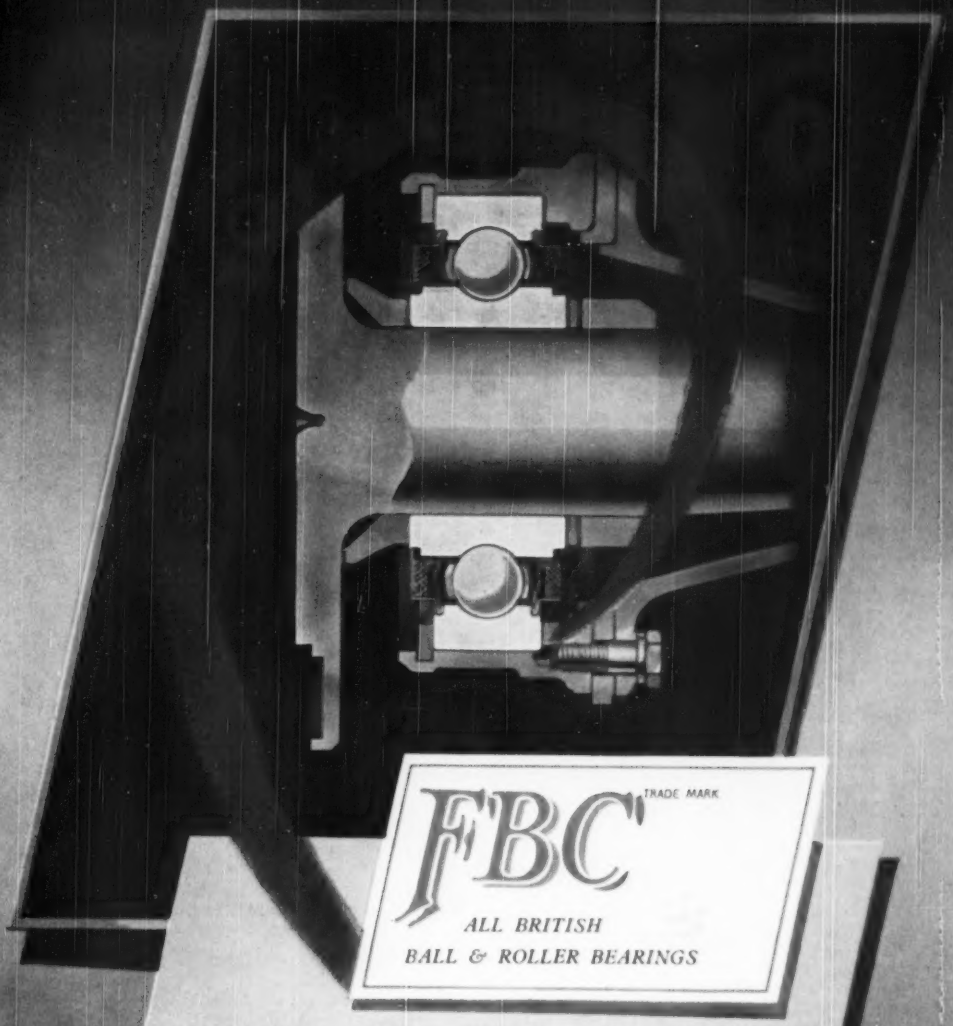

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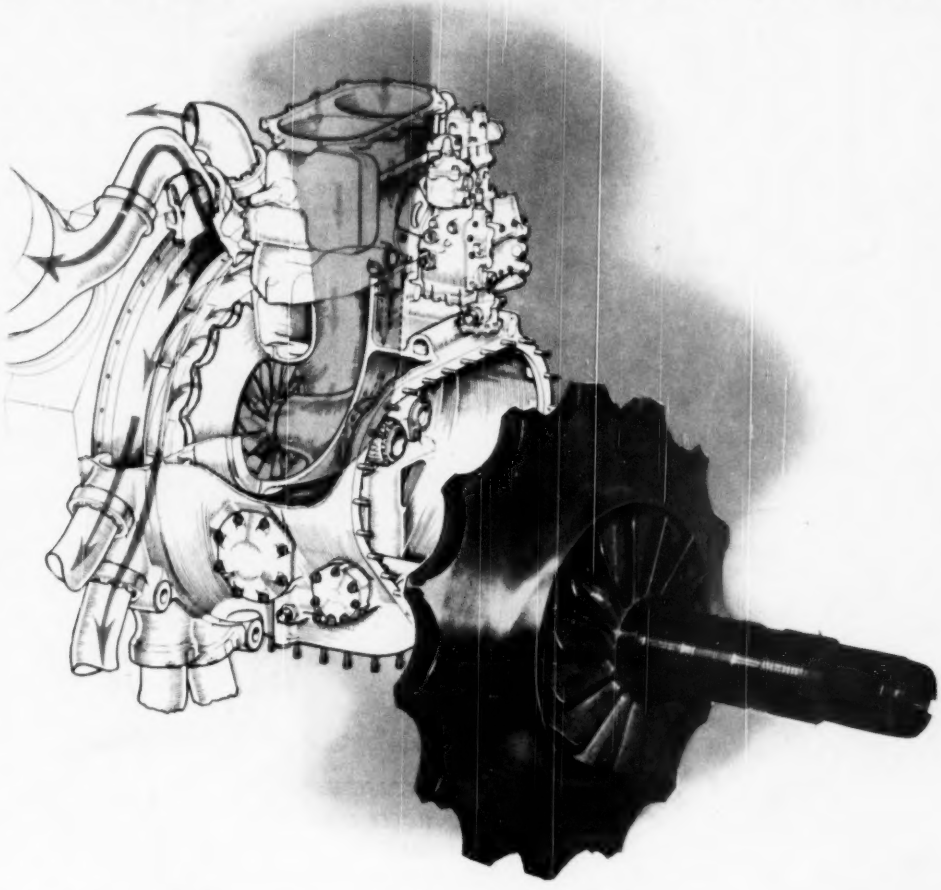

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